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A

HISTORY

OF

THE EARTH

AND

ANIMATED NATURE

BY

OLIVER GOLDSMITH, M.B.

A NEW EDITION,
WITH CORRECTIONS AND ALTERATIONS.

IN FOUR VOLUMES.
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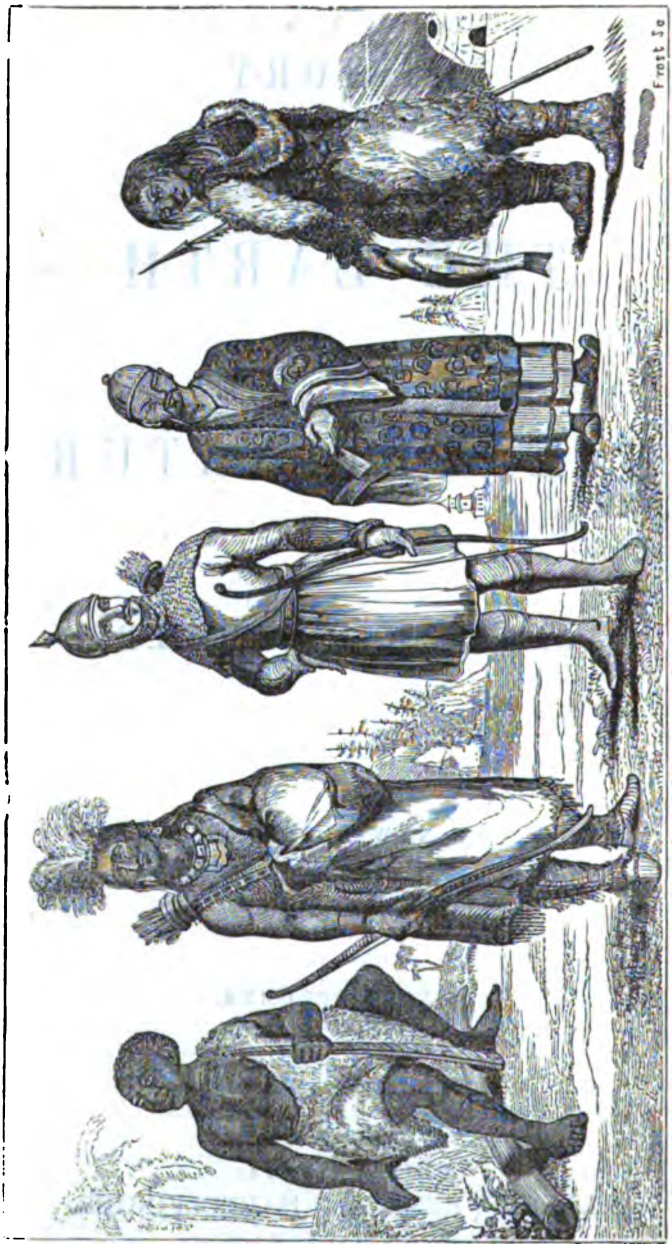

Negro, p. 244. American Indian, p. 246. European, p. 246. Chinese Tartar Race, p. 232. Laplander, p. 140.

CONTENTS.

VOL. I.

PART I.

Page

CHAP. I. A Sketch of the Universe ... 9

CHAP. II. A short survey of the Globe, from the light of Astronomy, and Geography ... 11

CHAP. III. A view of the surface of the Earth ... 14

CHAP. IV. A review of the different Theories of the Earth ... 16

CHAP. V. Fossil-shells and other extraneous Fossils ... 23

CHAP. VI. The internal structure of the Earth ... 27

CHAP. VII. Caves and Subterraneous Passages that sink, but not perpendicularly, into the Earth ... 32

CHAP. VIII. Mines, Damps, and Mineral Vapours ... 36

CHAP. IX. Volcanoes and Earthquakes ... 41

CHAP. X. Earthquakes ... 47

CHAP. XI. The appearance of Islands and Tracts; and of the disappearing of others ... 55

CHAP. XII. Mountains ... 59

CHAP. XIII. Waters ... 69

CHAP. XIV. The origin of Rivers ... 81

CHAP. XV. The Ocean in general; and of its Saltness ... 94

CHAP. XVI. The Tides, Motion, and Currents of the Sea; with their effects 102

CHAP. XVII. The changes produced by the Sea upon the Earth ... 110

CHAP. XVIII. A summary account of the mechanical properties of the air . 121

CHAP. XIX. An Essay towards a natural history of the Air ... 126

CHAP. XX. Winds regular and irregular ... 135

CHAP. XXI. Meteors, and such appearances as result from a combination of the Elements ... 147

CHAP. XXII. The conclusion ... 157

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PART II.

ANIMALS.

CHAP. I. A comparison of Animals, with the inferior ranks of Creation .. 161

CHAP. II. The generation of Animals ... 166

CHAP. III. The infancy of Man ... 179

CHAP. IV. Puberty ... 186

CHAP. V. The Age of Manhood ... 189

CHAP. VI. Sleep and Hunger ... 206

CHAP. VII. Seeing ... 214

CHAP. VIII. Hearing ... 221

CHAP. IX. Smelling, Feeling, and Tasting ... 227

CHAP. X. Old age and Death ... 232

CHAP. XI. The varieties in the Human Race ... 239

CHAP. XII. Monsters ... 251

CHAP. XIII. Mummies, Wax-works, &c. ... 260

CHAP XIV. Animals ... 267

CHAP. XV. Quadrupeds in general, compared to Man ... 275

PREFACE.

Natural History, considered in its utmost extent, comprehends two objects. First, that of discovering, ascertaining, and naming all the various productions of Nature. Secondly, that of describing the properties, manners, and relations which they bear to us, and to each other. The first, which is the most difficult part of this science, is systematical, dry, mechanical, and incomplete. The second is more amusing, exhibits new pictures to the imagination, and improves our relish for existence, by widening the prospect of Nature around us.

Both, however, are necessary to those who would understand this pleasing science, in its utmost extent. The first care of every inquirer, no doubt, should be, to see, to visit, and examine every object, before he pretends to inspect its habitudes or its history. From seeing and observing the thing itself, he is most naturally led to speculate upon its uses, its delights, or its inconveniences.

Numberless obstructions, however, are found in this part of his pursuit, that frustrate his diligence, and retard his curiosity. The objects in Nature are so many, and even those of the same kind are exhibited in such a variety of forms, that the inquirer finds himself lost in the exuberance before him, and, like a man who attempts to count the stars, unassisted by Art, his powers are all distracted in the barren superfluity.

To remedy this embarrassment, artificial systems have been devised, which grouping into masses those parts of Nature more nearly resembling each other, refer the inquirer for the name of the single object he desires to know, to some one of those general distributions, where it is to be found by further examination.

If, for instance, a man should, in his walks, meet with an animal, the name, and consequently the history of which, he desires to know, he is taught by systematic writers of natural history, to examine its most obvious qualities, whether a quadruped, a bird, a fish, or an insect. Having determined it, for explanation sake, to be an insect, he examines whether it has wings; if he finds it possessed of these, he is taught to examine whether it has two or four; if possessed of four, he is taught to observe, whether the two upper wings are of a shelly hardness, and serve as cases to those under them; if he finds the wings composed in this manner, he is then taught to pronounce, that this insect is one of the beetle kind: of the beetle kind, there are three different classes, distinguished from each other by their feelers; he examines the insect before him, and finds that the feelers are clavated or knobbed at the ends; of beetles, with feelers thus formed, there are ten kinds; and, among those, he is taught to look for the precise name of that which is before him. If, for instance, the knob be divided at the ends, and the belly be streaked with white, it is no other than the Dor or the May-bug; an animal, the noxious qualities of which give it a very distinguished rank in the history of the insect creation. In this manner a system of natural history may, in some measure, be compared to a dictionary of words. Both are solely intended to explain the names of things;

but with this difference, that in the dictionary of words we are led from the name of the thing to its definition; whereas in the system of natural history, we are led from the definition to find out the name.

Such are the efforts of writers, who have composed their works with great labour and ingenuity, to direct the learner in his progress through Nature, and to inform him of the name of every animal, plant, or fossil substance, that he happens to meet with; but it would be only deceiving the reader, to conceal the truth, which is, that books alone can never teach him this art in perfection; and the solitary student can never succeed. Without a master, and a previous knowledge of many of the objects of Nature, his book will only serve to confound and disgust him. Few of the individual plants or animals, that he may happen to meet with, are in that precise state of health, or that exact period of vegetation, from whence their descriptions were taken. Perhaps he meets the plant only with leaves, but the systematic writer has described it in a flower. Perhaps he meets the bird before it has moulted its first feathers, while the systematic description was made in its state of full perfection. He thus ranges without an instructor, confused, and with sickening curiosity from subject to subject, till at last he gives up the pursuit, in the multiplicity of his disappointments.

Some practice, therefore, much instruction, and diligent reading, are requisite to make a ready and expert naturalist, who shall be able, even by the help of a system, to find out the name of every object he meets with. But when this tedious, though requisite part of study is attained, nothing but delight and variety attend the rest of his journey. Wherever he travels, like a man in a country where he has many friends, he meets with nothing but acquaintances and allurements in all the stages of his way. The mere uninformed spectator passes on in gloomy solitude; but the naturalist, in every plant, in every insect, and every pebble, finds something to entertain his curiosity, and excite his speculation.

From hence it appears, that a system may be considered as a dictionary in the study of Nature. The ancients, however, who have all written most delightfully on this subject, seem entirely to have rejected those humble and mechanical helps to science. They contented themselves with seizing upon the great outlines of history, and passing over what was common, as not worth the detail, they only dwelt upon what was new, great and surprising, and sometimes even warmed the imagination at the expense of truth. Such of the moderns as revived this science in Europe, undertook the task more methodically, though not in a manner so pleasing. Aldrovandus, Gesner, and Johnson seemed desirous of uniting the entertaining and rich descriptions of the ancients with the dry and systematic arrangement, of which they were the first projectors. This attempt, however, was extremly imperfect, as the great variety of Nature was, as yet, but very inadequately known. Nevertheless, by attempting to carry on both objects at once, first of directing us to the name of the thing, and then giving the detail of its history, they drew out their works into a tedious and unreasonable length; and thus, mixing incompatible aims, they have left their labours rather to be occasionally consulted, than read with delight, by posterity.

The later moderns, with that good sense which they have carried into every other part of science, have taken a different method cultivating natural history. They have been content to give, not only the brevity, but also the dry and disgusting air of a dictionary to their systems. Ray, Klin, Brisson, and Linnæus, have had only one aim that of pointing out the object in Nature, of discovering its name, and where it was to be found in those authors that treated of it in a more prolix and satisfactory manner. Thus natural history, at present, is carried on in two distinct and separate channels, the one serving to lead us to the thing, the other conveying the history of the thing, as supposing it already known.

The following Natural History is written, with only such an attention to system as serves to remove the reader's embarrassments, and allure him to proceed. It can make no pretensions in directing him to the name of every object he meets with; that belongs to works of a very different kind, and written with very different aims. It will fully answer my design, if the reader, being already possessed of the name of any animal, shall find here a short, though satisfactory history of its habitudes, its subsistence, its manners, its friendships, and hostilities. My aim has been to carry on just as much method as was sufficient to shorten my description, by generalizing them, and never to follow order where the art of writing, which is but another name for good sense, informed me that it would only contribute to the reader's embarrassment.

Still, however, the reader will perceive, that I have formed a kind of system in the history of every part of Animated Nature, directing myself by the great obvious distinctions that she herself seems to have made; which, though too few to point exactly to the name are yet sufficient to illuminate the subject, and remove the reader's perplexity. Mr. Buffon indeed, who has brought greater talents to this part of learning than any other man, has almost entirely rejected method in classing quadrupeds. This, with great deference to such a character, appears to me running into the opposite extreme; and, as some moderns have of late spent much time, great pains, and some learning, all to very little purpose, in systematic arrangement, he seems so much disgusted by their trifling, but ostentatious efforts, that he describes his animals almost in the order they happen to come before him. This want of method seems to be a fault; but he can lose little by a criticism which every dull man can make, or by an error in arrangement, from which the dullest are the most usually free.

In other respects, as far as this able philosopher has gone, I have taken him for my guide. The warmth of his style, and the brilliancy of his imagination, are inimitable. Leaving him, therefore, without a rival in these, and only availing myself of his information, I have been content to describe things in my own way; and though many of the materials are taken from him, yet I have added, retrenched, and altered, as I thought proper. It was my intention, at one time, whenever I differed from him, to have mentioned it at the bottom of the page; but this occurred so often, that I soon found it would look like envy, and might, perhaps, convict me of those very errors which I was wanting to lay upon him. I have, therefore, as being every way his debtor, concealed my dissent, where my opinion was different, but wherever I borrow from him, I take care at the bottom of the page to express my obligations. But though my obligations to this writer are many, they extend but to the smallest part of the work, as he has hitherto completed only the history of quadrupeds. I was therefore, left to my own reading alone, to make out the history of birds, fishes, and insects, of which the arrangement was so difficult, and the necessary information so widely diffused, and so obscurely related when found, that it proved by much the most laborious part of the undertaking. Thus having made use of Mr. Buffon's lights in the first part of the work, I may, with some share of confidence, recommend it to the public. But what shall I say to that part, where I have been entirely left without his assistance? As I would affect neither modesty nor confidence, it would be sufficient to say that my reading upon this part of the subject has been very extensive; and that I have taxed my scanty circumstances in procuring books, which are on this subject, of all others, the most expensive. In consequence of this industry, I here offer a work to the public, of a kind which has never been attempted in ours, or any other modern language that I know of. The ancients, indeed, and Pliny in particular, have anticipated me in the present manner of treating natural history. Like those historians who describe the events of a campaign, they have not condescended to give the private particulars of every individual that formed the army; they were content with characterizing the generals, and describing their operations, while they left it to meaner hands to carry the muster-roll. I have followed their manner, rejecting the numerous fables which they adopted, and adding the improvements of the moderns, which are so numerous, that they actually make up the bulk of natural history.

The delight which I found in reading Pliny, first inspired me with the idea of a work of this nature. Having a taste rather classical than scientific, and having but little employed myself in turning over the dry labours of modern system-makers, my earliest intention was to translate this agreeable writer, and by the help of a commentary to make my work as amusing as I could. Let us dignify natural history never so much with the grave appellation of *an useful science*, yet still we must confess that it is the occupation of the idle and the speculative, more than the busy, and the ambitious part of mankind. My intention, therefore, was to treat what I then conceived to be an idle subject, in an idle manner; and not to hedge round plain and simple narratives with hard words, accumulated distinctions, ostentatious learning, and disquisitions that produced no conviction. Upon the appearance, however, of Mr. Buffon's work, I dropped my former plan, and adopted the present, being convinced, by his manner, that the best imitation of the ancients was to write from our own feelings, and to imitate Nature.

It will be my chief pride, therefore, if this work may be found an innocent amusement for those who have nothing else to employ them, or who require a relaxation from labour. Professed naturalists will, no doubt, find it superficial; and yet I should hope that even these will discover hints and remarks gleaned from various readings, not wholly trite or elementary. I would wish for their approbation. But my chief ambition is to drag up the obscure and gloomy learning of the cell to open inspection: to strip it from its garb of austerity and to show the beauties of that form, which only the industrious and the inquisitive have been hitherto permitted to approach.

HISTORY OF THE EARTH.

CHAPTER I.

A SKETCH OF THE UNIVERSE.

The World may be considered as one vast mansion, where man has been admitted to enjoy, to admire, and to be grateful. The first desires of savage nature are merely to gratify the importunities of sensual appetite, and to neglect the contemplation of things, barely satisfied with their enjoyment: the beauties of nature, and all the wonders of creation, have but little charms for a being taken up in obviating the wants of the day, and anxious for precarious subsistence.

Philosophers, therefore, who have testified such surprise at the want of curiosity in the ignorant, seem not to consider that they are usually employed in making provisions of a more important nature; in providing rather for the necessities than the amusements of life. It is not till our more pressing wants are sufficiently supplied, that we can attend to the calls of curiosity; so that in every age scientific refinement has been the latest effort of human industry.

But human curiosity, though at first slowly excited, being at last possessed of leisure for indulging its propensity, becomes one of the greatest amusements of life, and gives higher satisfactions than what even the senses can afford. A man of this disposition turns all nature into a magnificent theatre, replete with objects of wonder and surprise, and fitted up chiefly for his happiness and entertainment: he industriously examines all things, from the minutest insect to the most finished animal; and, when his limited organs can no longer make the disquisition, he sends out his imagination upon new inquiries.

Nothing, therefore, can be more august and striking than the idea hich his reason, aided by his imagination, furnishes of the universe around him. Astronomers tell us, that this earth which we inhabit forms but a very minute part in that great assemblage of bodies of which the world is composed. It is a million of times less than the sun, by which it is enlightened. The planets also, which, like it, are subordinate to the sun's influence, exceed the earth a thousand times in magnitude. These, which were at first supposed to wander in the heavens without any fixed path, and that took their name from their apparent deviations, have long been found to perform their circuits with great exactness and strict regularity. They have been discovered as forming, with our earth, a system of bodies circulating round the sun, all obedient to one law, and impelled by one common influence.

Modern philosophy has taught us to believe, that when the great Author of nature began the work of creation, he chose to operate by second causes; and that, suspending the constant exertion of his power, he endued matter with a quality, by which the universal economy of nature might be continued without his immediate assistance. This quality is called *attraction;* a sort of approximating influence, which all bodies, whether terrestrial or celestial, are found to possess; and which in all increases as the quantity of matter in each increases. The sun, by far the greatest body in our system, is, of consequence, possessed of much the greatest share of this attracting power; and all the planets, of which our earth is one, are, of course, entirely subject to its superior influence. Were this power, therefore, left uncontrolled by the other, the sun must quickly have attracted all the bodies of our celestial system to itself; but it is equally counteracted by another power of equal efficacy; namely, a progressive force, which each planet received when it was impelled forward by the divine Architect, upon its first formation. The heavenly bodies of our system being thus acted upon by two opposing powers; namely, by that of *attraction*, which draws them towards the sun; and that of *impulsion*, which drives them straight forward into the great void of space; they pursue a track between these contrary directions; and each, like a stone whirled about in a sling, obeying two opposite forces, circulates round its great centre of heat and motion.

In this manner, therefore, is the harmony of our planetary system preserved. The sun, in the midst, gives heat, and light, and circular motion to the planets which surround it: Mercury, Venus, the Earth. Mars, Jupiter, Saturn, and Herschel or the Georgium Sidus, perform their constant circuits at different distances, each taking up a time to complete its revolutions proportioned to the greatness of the circle which it is to describe. The lesser planets also, which are attendants upon some of the greater, are subject to the same laws; they circulate with the same exactness; and are, in the same manner, influenced by their respective centres of motion.

Besides those bodies which make a part of our peculiar system, and which may be said to reside within its great circumference, there are others that frequently come among us, from the most distant tracts of space, and that seem like dangerous intruders upon the beautiful simplicity of nature. These are comets, whose appearance was once so terrible to mankind; and the theory of which is so little understood at present: all we know is, that their number is much greater than that of the planets; and that, like these, they roll in orbits, in some measure obedient to solar influence. Astronomers have endeavoured to calculate the returning periods of many of them; but experience has not, as yet, confirmed the veracity of their investigations. Indeed, who can tell, when those wanderers have made their excursions into other worlds and distant systems, what obstacles may be found to oppose their progress, to accelerate their motions, or retard their return?

But what we have hitherto attempted to sketch, is but a small part of that great fabric in which the Deity has thought proper to manifest his wisdom and omnipotence. There are multitudes of other bodies, dispersed over the face of the heavens, that lie too remote for examination: these have no motion, such as the planets are found to possess, and are therefore called *fixed stars;* and from their extreme brilliancy, and their immense distance, philosophers have been induced to suppose them to be suns, resembling that which enlivens our system. As the imagination also, once excited, is seldom content to stop, it has furnished each with an attendant system of planets belonging to itself, and has even induced some to deplore the fate of those systems, whose imagined suns, which sometimes happens, have become no longer visible.

But conjectures of this kind, which no reasoning can ascertain, nor experiment reach, are rather amusing than useful. Though we see the greatness and wisdom of the Deity in all the seeming worlds that surround us, it is our chief concern to trace Him in that which we inhabit. The examination of the earth, the wonders of its contrivance, the history of its advantages, or of the seeming defects in its formation, are the proper business of the *natural historian.* A description of this *earth*, its *animals*, *vegetables*, and *minerals*, is the most delightful entertainment the mind can be furnished with, as it is the most interesting and useful. I would beg leave, therefore, to conclude these common-place speculations, with an observation, which, I hope, is not entirely so.

A use, hitherto not much insisted upon, that may result from the contemplation of celestial magnificence is, that it will teach us to make an allowance for the apparent irregularities we find below. Whenever we examine the works of the Deity at a proper point of distance, so as to take in the whole of his design, we see nothing but uniformity, beauty, and precision. The heavens present us with a plan, which, though inexpressibly magnificent, is yet regular beyond the power of invention. Whenever, therefore, we find any apparent defects in the Earth, which we are about to consider, instead of attempting to reason ourselves into an opinion that they are beautiful, it will be wiser to say, that we do not behold them at the proper point of distance, and that our eye is laid too close to the objects to take in the regularity of their connexion. In short, we may conclude, that God, who is regular in his GREAT productions, acts with equal uniformity in the LITTLE.

CHAPTER II.

A SHORT SURVEY OF THE GLOBE, FROM THE LIGHT OF ASTRONOMY AND GEOGRAPHY.

ALL the sciences are in some measure linked with each other, and before the one is ended, the other begins. In a natural history, therefore, of the earth, we must begin with a short account of its situation and form, as given by astronomers and geographers: it will be sufficient, however, upon this occasion, just to hint to the imagination, what they, by the most abstract reasonings, have forced upon the understanding. The earth which we inhabit is, as has been said before, one of those bodies which circulate in our solar system; it is placed at a happy middle distance from the centre; and even seems, in this respect, privileged beyond all other planets that depend upon our great luminary for their support. Less distant from the sun than Herschel or the Georgium Sidus, Saturn, Jupiter, and Mars, and yet less parched up than Venus and Mercury, that are situate too near the violence of its power, the Earth seems in a peculiar manner to share the bounty of the Creator: it is not, therefore, without reason, that mankind consider themselves as the peculiar objects of his providence and regard.

Besides that motion which the earth has round the sun, the circuit of which is performed in a year, it has another upon its own axle, which it performs in twenty-four hours. Thus, like a chariot-wheel, it has a compound motion; for while it goes forward on its journey, it is all the while turning round upon itself. From the first of these two arise the grateful vicissitude of the seasons; from the second, that of day and night.

It may be also readily conceived, that a body thus wheeling in circles will most probably be itself a sphere. The earth, beyond all possibility of doubt, is found to be so. Whenever its shadow happens to fall upon the moon, in an eclipse, it appears to be always circular, in whatever position it is projected: and it is easy to prove, that a body which in every position makes a circular shadow, must itself be round. The rotundity of the earth may be also proved from the meeting of two ships at sea: the top-masts of each are the first parts that are discovered by both, the under parts being hidden by the convexity of the globe which rises between them. The ships, in this instance, may be resembled to two men who approach each other on the opposite sides of a hill: their heads will first be seen, and gradually as they come nearer they will come entirely into view.

However, though the earth's figure is said to be spherical, we ought only to conceive it as being nearly so. It has been found in the last age to be rather flatted at both poles, so that its form is commonly resembled to that of a turnip. The cause of this swelling of the equator is ascribed to the greater rapidity of the motion with which the parts of the earth are there carried round; and which, consequently, endeavouring to fly off, act in opposition to central attraction. The twirling of a mop may serve as a homely illustration; which, as every one has seen, spreads and grows broader in the middle as it continues to be turned round.

As the earth receives light and motion from the sun, so it derives much of its warmth and power of vegetation from the same beneficent source. However, the different parts of the globe participate of these advantages in very different proportions, and accordingly put on very different appearances; a polar prospect, and a landscape at the equator, are as opposite in their appearances as in their situation.

The polar regions, that receive the solar beams in a very oblique direction, and that continue for one half of the year in night, receive but few of the genial comforts that other parts of the world enjoy. Nothing can be more mournful or hideous than the picture which travellers present of those wretched regions. The ground,* which is rocky and barren, rears itself in every place in lofty mountains and inaccessible cliffs, and meets the mariner's eye at even forty leagues from shore. These precipices, frightful in themselves, receive an additional horror from being constantly covered with ice and snow, which daily seem to accumulate, and fill all the valleys with increasing desolation. The few rocks and cliffs, that are bare of snow, look at a distance of a dark brown colour, and quite naked. Upon a nearer approach, however, they are found replete with many different veins of coloured stone, here and there spread over with a little earth, and a scanty portion of grass and heath. The internal parts of the country are still more desolate and deterring. In wandering through these solitudes, some plains appear covered with ice, that, at first glance, seem to promise the traveller an easy journey.† but these are even more formidable and more unpassable than the mountains themselves, being cleft with dreadful chasms, and every where abounding with pits that threaten certain destruction. The seas that surround these inhospitable coasts, are still more astonishing, being covered with flakes of floating ice, that spread like extensive fields, or that rise out of the water like enormous mountains. These, which are composed of materials as clear and transparent as glass,‡ assume many strange and phantastic appearances. Some of them look like churches or castles, with pointed turrets; some like ships in full sail; and people have often given themselves the fruitless toil to attempt piloting the imaginary vessels into the harbour. There are still others that appear like large islands, with plains, valleys, and hills, which often rear their heads two hundred yards above the level of the sea, and although the height of these be amazing, yet their depth beneath is still more so; some of them being found to sink three hundred fathom under water.

The earth presents a very different appearance at the equator, where the sun-beams, darting directly downwards, burn up the lighter soils into extensive sandy deserts, or quicken all the moister tracts with incredible vegetation. In these regions, almost all the same inconveniences are felt from the proximity of the sun, that in the former were endured from its absence. The deserts are entirely barren, except where they are found to produce serpents, and that in such quantities, that some extensive plains seem almost entirely covered with them.§

It not unfrequently happens also, that this dry soil, which is so parched and comminuted by the force of the sun, rises with the smallest breeze of wind; and the sands being composed of parts, almost as small as those of water, they assume a similar appearance, rolling onward in waves like those of a troubled sea, and overwhelming all they meet with inevitable destruction. On the other hand, those tracts which are fertile teem with vegetation even to a noxious degree. The grass rises to such a height as often to require burning; the forests are impassable from underwoods, and so matted above, that even the sun, fierce as it is, can seldom penetrate.|| These are so thick as scarcely to be extirpated; for the tops being so bound together by the climbing plants that grow round them, though a hundred should be cut at the bottom, yet not one would fall, as they mutually support each other. In these dark and entangled forests, beasts of various kinds, insects in astonishing abundance, and serpents of surprising magnitude, find a quiet retreat from man, and are seldom disturbed except by each other.

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* Crantz's History of Greenland, p. 3. † Ibid, p. 22. ‡ Ibid, p. 27.

§ Adanson's Description of Senegal. || Linnæi Amænit. vol. vi p. 67

In this manner the extremes of our globe seem equally unfitted for the comforts and conveniences of life: and although the imagination may find an awful pleasure in contemplating the frightful precipices of Greenland, or the luxurious verdure of Africa, yet true happiness can only be found in the more moderate climates, where the gifts of nature may be enjoyed, without incurring danger in obtaining them.

It is in the temperate zone, therefore, that all the arts of improving nature, and refining upon happiness, have been invented: and this part of the earth is, more properly speaking, the theatre of natural history. Although there be millions of animals and vegetables in the unexplored forests under the line, yet most of these may for ever continue unknown, as curiosity is there repressed by surrounding danger. But it is otherwise in these delightful regions which we inhabit, and where this art has had its beginning. Among us there is scarce a shrub, a flower, or an insect, without its particular history; scarce a plant that could be useful, which has not been propagated; nor a weed that could be noxious, which has not been pointed out.

CHAPTER III.

A VIEW OF THE SURFACE OF THE EARTH.

When we take a slight survey of the surface of our globe, a thousand objects offer themselves, which, though long known, yet still demand our curiosity. The most obvious beauty that every where strikes the eye, is the verdant covering of the earth, which is formed by a happy mixture of herbs and trees of various magnitudes and uses. It has been often remarked, that no colour refreshes the sight so much as green: and it may be added, as a further proof of the assertion, that the inhabitants of those places where the fields are continually white with snow, generally become blind long before the usual course of nature.

This advantage, which arises from the verdure of the fields, is not a little improved by their agreeable inequalities. There are scarcely two natural landscapes that offer prospects entirely resembling each other: their risings and depressions, their hills and valleys, are never entirely the same, but always offer something new to entertain and refresh the imagination.

But to increase the beauties of the face of nature, the landscape is enlivened by springs and lakes, and intersected by rivulets. These lend a brightness to the prospect; give motion and coolness to the air; and, what is much more important, furnish health and subsistence to animated nature.

Such are the most obvious and tranquil objects that every where offer: but there are others of a more awful and magnificent kind; the *Mountain* rising above the clouds, and topped with snow; the *River* pouring down its sides, increasing as it runs, and losing itself, at last, in the ocean; the *Ocean* spreading its immense sheet of waters over one half of the globe, swelling and subsiding at well-known intervals, and forming a communication between the most distant parts of the earth.

If we leave those objects that seem to be natural to our earth, and keep the same constant tenor, we are presented with the great irregularities of nature. The burning mountain; the abrupt precipice; the unfathomable cavern; the headlong cataract; and the rapid whirlpool.

If we carry our curiosity a little further, and descend to the objects immediately below the surface of the globe, we shall there find wonders still as amazing. We first perceive the earth for the most part lying in regular beds or layers, every bed growing thicker in proportion as it lies deeper, and its contents more compact and heavy. We shall find, almost wherever we make our subterranean inquiry, an amazing number of shells that once belonged to aquatic animals. Here and there, at a distance from the sea, beds of oyster-shells, several yards thick, and many miles over; sometimes testaceous substances of various kinds on the tops of mountains, and often in the heart of the hardest marble. These, which are dug up by the peasants in every country, are regarded with little curiosity; for being so very common, they are considered as substances entirely terrene. But it is otherwise with the inquirer after nature, who finds them, not only in shape but in substance, every way resembling those that are found in the sea; and he, therefore, is at a loss to account for their removal.

Yet not one part of nature alone, but all her productions and varieties, become the object of the speculative man's inquiry: he takes different views of nature from the inattentive spectator; and scarce an appearance, how common soever, but affords matter for his contemplation: he inquires how and why the surface of the earth has those risings and depressions which most men call natural; he demands in what manner the mountains were formed, and in what consists their uses; he asks from whence springs arise, and how rivers flow round the convexity of the globe; he enters into an examination of the ebbings and flowings, and the other wonders of the deep; he acquaints himself with the irregularities of nature, and endeavours to investigate their causes; by which, at least, he will become better versed in their history. The internal structure of the globe becomes an object of his curiosity; and, although his inquiries can fathom but a very little way, yet, if possessed with a spirit of theory, his imagination will supply the rest. He will endeavour to account for the situation of the marine fossils that are found in the earth, and for the appearance of the different beds of which it is composed. These have been the inquiries that have splendidly employed many of the philosophers of the last and present age,* and, to a certain degree, they must be serviceable. But the worst of it is, that, as speculations amuse the writer more than facts, they may be often carried to an extravagant length; and that time may be spent in reasoning upon nature, which might be more usefully employed in writing her history.

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* Buffon, Woodward, Burnet, Whiston, Kircher, Bourquet, Leibnitz, Steno, Ray, &c.

Too much speculation in natural history is certainly wrong; but there is a defect of an opposite nature that does much more prejudice; namely, that of silencing all inquiry by alleging the benefits we receive from a thing, instead of investigating the cause of its production. If I inquire how a mountain came to be formed; such a reasoner, enumerating its benefits, answers, because God knew it would be useful. If I demand the cause of an earthquake, he finds some good produced by it, and alleges that as the cause of its explosion. Thus such an inquirer has constantly some ready reason for every appearance in nature, which serves to swell his periods, and give splendour to his declamation: every thing about him is, on some account or other, declared to be good; and he thinks it presumption to scrutinize into its defects, or to endeavour to imagine how it might be better. Such writers, and there are many such, add very little to the advancement of knowledge. It is finely remarked by Bacon, that the investigation of final causes[*] is a barren study; and, like a virgin dedicated to the Deity, brings forth nothing. In fact, those men who want to compel every appearance and every irregularity in nature into our service, and expatiate on their benefits, combat that very morality which they would seem to promote. God has permitted thousands of natural evils to exist in the world, because it is by their intervention that man is capable of moral evil; and he has permitted that we should be subject to moral evil, that we might do something to deserve eternal happiness, by showing that we had the rectitude to avoid it.

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CHAPTER IV.

A REVIEW OF THE DIFFERENT THEORIES OF THE EARTH.

Human invention has been exercised for several ages to account for the various irregularities of the earth. While those philosophers, mentioned in the last chapter, see nothing but beauty, symmetry, and order; there are others, who look upon the gloomy side of nature, enlarge on its defects, and seem to consider the earth, on which they tread, as one scene of extensive desolation.[†] Beneath its surface they observe minerals and waters confusedly jumbled together; its different beds of earth irregularly lying upon each other; mountains rising from places that once were level;[‡] and hills sinking into valleys; whole regions swallowed by the sea, and others again rising out of its bosom. All these they suppose to be but a few of the changes that have been wrought in our globe; and they send out the imagination to describe its primæval state of beauty.

Of those who have written theories describing the manner of the original formation of the earth, or accounting for its present appear ances, the most celebrated are Burnet, Whiston, Woodward, and Buffon. As speculation is endless, so it is not to be wondered that all these differ from each other, and give opposite accounts of the several changes, which they suppose our earth to have undergone. As the systems of each have had their admirers, it is, in some measure, incumbent upon the natural historian to be acquainted, at least, with their outlines; and, indeed, to know what others have even dreamed in matters of science, is very useful, as it may often prevent us from indulging similar delusions ourselves, which we should never have adopted, but because we take them to be wholly our own. However, as entering into a detail of these theories, is rather furnishing a history of opinions than things, I will endeavour to be as concise as I can.

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[*] Investigatio causarum finalium sterilis est, et veluti virgo Deo dicata nil parit.

[†] Buffon's second Discourse. [‡] Senec. Quæst. lib. vi. cap. 21

The first who formed this amusement of earth-making into system, was the celebrated Thomas Burnet, a man of polite learning and rapid imagination. His *Sacred Theory*, as he calls it, describing the changes which the earth has undergone, or shall hereafter undergo, is well known for the warmth with which it is imagined, and the weakness with which it is reasoned; for the elegance of its style, and the meanness of its philosophy. "The earth," says he, "before the deluge, was very differently formed from what it is at present: it was at first a fluid mass; a chaos composed of various substances, differing both in density and figure: those which were most heavy sunk to the centre, and formed in the middle of our globe a hard solid body; those of a lighter nature remained next; and the waters, which were lighter still, swam upon its surface, and covered the earth on every side. The air, and all those fluids which were lighter than water, floated upon this also; and in the same manner encompassed the globe; so that between the surrounding body of waters, and the circumambient air, there was formed a coat of oil, and other unctuous substances, lighter than water. However, as the air was still extremely impure, and must have carried up with it many of those earthy particles with which it once was intimately blended, it soon began to defecate, and to depose these particles upon the oily surface already mentioned, which soon uniting, the earth and oil formed that crust, which soon became a habitable surface, giving life to vegetation, and dwelling to animals.

"This imaginary antideluvian abode was very different from what we see it at present. The earth was light and rich; and formed of a substance entirely adapted to the feeble state of incipient vegetation: it was a uniform plain, every where covered with verdure; without mountains, without seas, or the smallest inequalities. It had no difference of seasons, for its equator was in the plane of the ecliptic, or, in other words, it turned directly opposite to the sun, so that it enjoyed one perpetual and luxuriant spring. However, this delightful face of nature did not long continue in the same state; for, after a time, it began to crack and open in fissures; a circumstance which always succeeds when the sun exhales the moisture from rich or marshy situations. The crimes of mankind had been for some time preparing to draw down the wrath of Heaven; and they, at length, induced the Deity to defer repairing these breaches in nature. Thus the chasms of the earth every day became wider, and, at length, they penetrated to the great abyss of waters; and the whole earth, in a manner, fell in. Then ensued a total disorder in the uniform beauty of the first creation, the terrene surface of the globe being broken down; as it sunk the waters gushed out into its place; the deluge became universal; all mankind, except eight persons, were destroyed, and their posterity condemned to toil upon the ruins of desolated nature."

It only remains to mention the manner in which he relieves the earth from this universal wreck, which would seem to be as difficult as even its first formation: "These great masses of earth falling into the abyss, drew down with them vast quantities also of air; and, by dashing against each other, and breaking into small parts by the repeated violence of the shock, they, at length, left between them large cavities, filled with nothing but air. These cavities naturally offered a bed to receive the influent waters; and in proportion as they filled, the face of the earth became once more visible. The higher parts of its broken surface, now become the tops of the mountains, were the first that appeared; the plains soon after came forward, and, at length, the whole globe was delivered from the waters, except the places in the lowest situations; so that the ocean and the seas are still a part of the ancient abyss, that have not had a place to return. Islands and rocks are fragments of the earth's former crust; kingdoms and continents are larger masses of its broken substance; and all the inequalities that are to be found on the surface of the present earth, are owing to the accidental confusion into which both earth and waters were then thrown."

The next theorist was Woodward, who, in his Essay towards a Natural History of the Earth, which was only designed to precede a greater work, has endeavoured to give a more rational account of its appearance; and was, in fact, much better furnished for such an undertaking than any of his predecessors, being one of the most assiduous naturalists of his time. His little book, therefore, contains many important facts, relative to natural history, although his system may be weak and groundless.

He begins by asserting that all terrene substances are disposed in beds of various natures, lying horizontally one over the other, somewhat like the coats of an onion: that they are replete with shells, and other productions of the sea; these shells being found in the deepest cavities, and on the tops of the highest mountains. From these observations, which are warranted by experience, he proceeds to observe, that these shells and extraneous fossils are not productions of the earth, but are all actual remains of those animals which they are known to resemble; that all the beds of the earth lie under each other, in the order of their specific gravity; and that they are disposed as if they had been left there by subsiding waters. All these assertions he affirms with much earnestness, although daily experience contradicts him in some of them; particularly we find layers of stone often over the lightest soils, and the softest earth under the hardest bodies. However, having taken it for granted, that all the layers of the earth are found in the order of their specific gravity, the lightest at the top, and the heaviest next the centre, he consequently asserts, and it will not improbably follow, that all the substances of which the earth is composed were once in an actual state of dissolution. This universal dissolution he takes to have happened at the time of the flood. He supposes, that at that time a body of water, which was then in the centre of the earth, uniting with that which was found on the surface, so far separated the terrene parts as to mix all together in one fluid mass; the contents of which afterwards sinking according to their respective gravities, produced the present appearances of the earth. Being aware, however, of an objection, that fossil substances are not found dissolved, he exempts them from this universal dissolution, and, for that purpose, endeavours to show that the parts of animals have a stronger cohesion than those of minerals; and that, while even the hardest rocks may be dissolved, bones and shells may still continue entire.

So much for Woodward; but of all the systems which were published respecting the earth's formation, that of Whiston was most applauded, and most opposed. Nor need we wonder: for being supported with all the parade of deep calculation, it awed the ignorant, and produced the approbation of such as would be thought otherwise; as it implied a knowledge of abstruse learning, to be even thought capable of comprehending what the writer aimed at. In fact, it is not easy to divest this theory of its mathematical garb; but those who have had leisure, have found the result of our philosopher's reasoning to be thus: He supposes the earth to have been originally a comet; and he considers the history of the creation, as given us in scripture, to have its commencement just when it was, by the hand of the Creator, to be more regularly placed as a planet in our solar system. Before that time he supposes it to have been a globe without beauty or proportion; a world in disorder; subject to all the vicissitudes which comets endure; some of which have been found, at different times, a thousand times hotter than melted iron; at others, a thousand times colder than ice. These alternations of heat and cold, continually melting and freezing the surface of the earth, he supposes to have produced, to a certain depth, a chaos entirely resembling that described by the poets, surrounding the solid contents of the earth, which still continued unchanged in the midst, making a great burning globe of more than two thousand leagues in diameter. This surrounding chaos, however, was far from being solid: he resembles it to a dense though fluid atmosphere, composed of substances mingled, agitated, and shocked against each other; and in this disorder he describes the earth to have been just at the eve of creation.

But upon its orbit being then changed, when it was more regularly wheeled round the sun, every thing took its proper place; every part of the surrounding fluid then fell into a situation, in proportion as it was light or heavy.

The middle, or central part, which always remained unchanged, still continued so, retaining a part of that heat which it received in its primeval approaches towards the sun: which heat, he calculates, may continue for about six thousand years. Next to this fell the heavier parts of the chaotic atmosphere, which serve to sustain the lighter: but as in descending they could not entirely be separated from many watery parts, with which they were intimately mixed, they drew down a part of these also with them;

and these could not mount again after the surface of the earth was consolidated: they, therefore, surrounded the heavy first descending parts, in the same manner as these surround the central globe. Thus the entire body of the earth is composed internally of a great burning globe; next which is placed a heavy terrene substance, that encompasses it; round which also is circumfused a body of water. Upon this body of water, the crust of earth, which we inhabit, is placed: so that, according to him, the globe is composed of a number of coats, or shells, one within the other, all of different densities. The body of the earth being thus formed, the air, which is the lightest substance of all, surrounded its surface; and the beams of the sun, darting through, produced that light which, we are told, first obeyed the Creator's command.

The whole economy of the creation being thus adjusted, it only remained to account for the risings and depressions on the surface of the earth, with the other seeming irregularities of its present appearance. The hills and valleys are considered by him as formed by their pressing upon the internal fluid, which sustains the outward shell of earth, with greater or less weight: those parts of the earth which are heaviest sink into the subjacent fluid more deeply, and become valleys: those that are lightest, rise higher upon the earth's surface, and are called mountains.

Such was the face of nature before the deluge; the earth was then more fertile and populous than it is at present; the life of man and animals was extended to ten times its present duration; and all these advantages arose from the superior heat of the central globe, which ever since has been cooling. As its heat was then in full power, the genial principle was also much greater than at present; vegetation and animal increase were carried on with more vigour; and all nature seemed teeming with the seeds of life. But these physical advantages were only productive of moral evil; the warmth which invigorated the body increased the passions and appetites of the mind; and, as man became more powerful he grew less innocent. It was found necessary to punish this depravity; and all living creatures were overwhelmed by the deluge in universal destruction.

This deluge, which simple believers are willing to ascribe to a miracle, philosophers have long been desirous to account for by natural causes: they have proved that the earth could never supply from any reservoir towards its centre, nor the atmosphere by any discharge from above, such a quantity of water as would cover the surface of the globe to a certain depth over the tops of our highest mountains. Where, therefore, was all this water to be found? Whiston has found enough, and more than a sufficiency, in the tail of a comet; for he seems to allot comets a very active part in the great operations of nature.

He calculates, with great seeming precision, the year, the month, and the day of the week, on which this comet (which has paid the earth some visits since, though at a kinder distance) involved our globe in its tail. The tail he supposed to be a vaporous fluid substance, exhaled from the body of the comet by the extreme heat of the sun, and increasing in proportion as it approached that great luminary. It was in this that our globe was involved at the time of the deluge; and, as the earth still acted by its natural attraction, it drew to itself all the watery vapours which were in the comet's tail; and the internal waters being also at the same time let loose, in a very short space the tops of the highest mountains were laid under the deep.

The punishment of the deluge being thus completed, and all the guilty destroyed, the earth, which had been broken by the eruption of the internal waters, was also enlarged by it; so that, upon the comet's recess, there was found room sufficient in the internal abyss for the recess of the superfluous waters; whither they all retired, and left the earth uncovered, but in some respects changed, particularly in its figure, which, from being round, was now become oblate. In this universal wreck of nature, Noah survived, by a variety of happy causes, to re-people the earth, and to give birth to a race of men slow in believing ill-imagined theories of the earth.

After so many theories of the earth, which had been published, applauded, answered, and forgotten, Mr. Buffon ventured to add one more to the number. This philosopher was, in every respect, better qualified than any of his predecessors for such an attempt, being furnished with more materials, having a brighter imagination to find new proofs, and a better style to clothe them in. However, if one so ill qualified as I am may judge, this seems the weakest part of his admirable work; and I could wish that he had been content with giving us facts instead of systems; that, instead of being a reasoner, he had contented himself with being merely a historian.

He begins his system by making a distinction between the first part of it and the last; the one being founded only on conjecture, the other depending entirely upon actual observation. The latter part of his theory may, therefore, be true, though the former should be found erroneous.

"The planets," says he, "and the earth among the number, might have been formerly (he only offers this as conjecture) a part of the body of the sun, and adherent to its substance. In this situation, a comet falling in upon that great body, might have given it such a shock, and so shaken its whole frame, that some of its particles might have been driven off like streaming sparkles from red-hot iron; and each of these streams of fire, small as they were in comparison of the sun, might have been large enough to have made an earth as great, nay, many times greater than ours. So that in this manner the planets, together with the globe which we inhabit, might have been driven off from the body of the sun by an impulsive force: in this manner also they would continue to recede from it for ever, were they not drawn back by its superior power of attraction; and thus, by the combination of the two motions, they are wheeled round in circles.

"Being in this manner detached at a distance from the body of the sun, the planets, from having been at first globes of liquid fire, gradually became cool. The earth also having been impelled obliquely forward, received a rotatory motion upon its axis at the very instant of its formation; and this motion being greatest at the equator, the parts there acting against the force of gravity, they must have swollen out, and given the earth an oblate or flatted figure.

"As to its internal substance, our globe, having once belonged to the sun, it continues to be a uniform mass of melted matter, very probably vitrified in its primeval fusion. But its surface is very differently composed. Having been in the beginning heated to a degree equal to, if not greater than what comets are found to sustain; like them it had an atmosphere of vapours floating round it, and which cooling by degrees, condensed and subsided upon its surface. These vapours formed, according to their different densities, the earth, the water, and the air; the heavier parts falling first, and the lighter remaining still suspended."

Thus far our philosopher is, at least, as much a system-maker as Whiston or Burnet; and, indeed, he fights his way with great perseverance and ingenuity, through a thousand objections that naturally arise Having, at last, got upon the earth, he supposes himself on firmer ground, and goes forward with greater security. Turning his attention to the present appearance of things upon this globe, he pronounces from the view, that the whole earth was at first under water. This water he supposes to have been the lighter parts of its former evaporation, which, while the earthy particles sunk downwards by their natural gravity, floated on the surface, and covered it for a considerable space of time.

"The surface of the earth," says he,* "must have been in the beginning much less solid than it is at present; and, consequently, the same causes which at this day produce but very slight changes, must then, upon so complying a substance, have had very considerable effects. We have no reason to doubt but that it was then covered with the waters of the sea; and that those waters were above the tops of our highest mountains: since, even in such elevated situations, we find shells and other marine productions in very great abundance. It appears also that the sea continued for a considerable time upon the face of the earth: for as these layers of shells are found so very frequent at such great depths, and in such prodigious quantities, it seems impossible for such numbers to have been supported all alive at one time: so that they must have been brought there by successive depositions. These shells are also found in the bodies of the hardest rocks, where they could not have been deposited, all at once, at the time of the deluge, or at any such instant revolution; since that would be to suppose, that all the rocks in which they are found, were, at that instant, in a state of dissolution, which would he absurd to assert. The sea, therefore, deposited them wheresoever they are now to be found, and that by slow and successive degrees.

"It will appear also, that the sea covered the whole earth, from the appearance of its layers, which lying regularly one above the other, seem all to resemble the sediment formed at different times by the ocean. Hence, by the irregular force of its waves, and its currents driving the bottom into sand-banks, mountains must have been gradually formed within this universal covering of waters; and these successively raising their heads above its surface, must, in time, have formed the highest ridges of mountains upon land, together with con tinents, islands, and low grounds, all in their turns. This opinion will receive additional weight by considering, that in those parts of the earth where the power of the ocean is greatest, the inequalities on the surface of the earth are highest. The ocean's power is greatest at the equator, where its winds and tides are most constant; and, in fact, the mountains at the equator are found to be higher than in any other part of the world. The sea, therefore, has produced the principal changes in our earth: rivers, volcanoes, earthquakes, storms, and rain, having made but slight alterations, and only such as have affected the globe to very inconsiderable depths."

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* Theorie de la Terre, vol. i. p. 111.

This is but a very slight sketch of Mr. Buffon's Theory of the Earth; a theory which he has much more powerfully supported, than happily invented; and it would be needless to take up the reader's time from the pursuit of truth in the discussion of plausibilities. In fact, a thousand questions might be asked this most ingenious philosopher, which he would not find it easy to answer; but such is the lot of humanity, that a single Goth can in one day destroy the fabric which Cæsars were employed an age in erecting. We might ask, how mountains, which are composed of the most compact and ponderous substances, should be the first whose parts the sea began to remove? We might ask, how fossil-wood is found deeper even than shells? which argues, that trees grew upon the places he supposes once to have been covered with the ocean. But we hope this excellent man is better employed than to think of gratifying the petulance of incredulity, by answering endless objections.

CHAPTER V.

OF FOSSIL-SHELLS, AND OTHER EXTRANEOUS FOSSILS.

We may affirm of Mr. Buffon, that which has been said of the chymists of old; though he may have failed in attaining his principal aim, of establishing a theory, yet he has brought together such a multitude of facts relative to the history of the earth, and the nature of its fossil productions, that curiosity finds ample compensation, even while it feels the want of conviction.

Before, therefore, I enter upon the description of those parts of the earth, which seem more naturally to fall within the subject, it will not be improper to give a short history of those animal productions that are found in such quantities, either upon its surface, or at different depths below it. They demand our curiosity; and, indeed, there is nothing in natural history that has afforded more scope for doubt, conjecture, and speculation. Whatever depths of the earth we examine, or at whatever distance within land we seek, we most commonly find a number of fossil-shells, which being compared with others from the sea, of known kinds, are found to be exactly of a similar shape and nature.* They are found at the very bottom of quarries and mines, in the retired and inmost parts of the most firm and solid rocks, upon the tops of even the highest hills and mountains, as well as in the valleys and plains: and this not in one country alone, but in all places where there is any digging for marble, chalk, or any other terrestrial matters, that are so compact as to fence off the external injuries of the air, and thus preserve these shells from decay.

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* Woodward's Essay towards a Natural History, p. 16.

These marine substances, so commonly diffused, and so generally to be met with, were for a long time considered by philosophers as productions, not of the sea, but of the earth. "As we find that spars," said they, "always shoot into peculiar shapes, so these seeming snail, cockle, and muscle-shells, are only sportive forms that nature assumes amongst others of its mineral varieties: they have the shape of fish, indeed, but they have always been terrestrial substances."*

With this plausible solution mankind were for a long time content; but, upon closer inquiry, they were obliged to alter their opinion. It was found that these shells had in every respect the properties of animal, and not of mineral nature. They were found exactly of the same weight with their fellow shells upon shore. They answered all the chymical trials in the same manner as sea-shells do. Their parts, when dissolved, had the same appearance to view, the same smell and taste. They had the same effects in medicine, when inwardly administered; and, in a word, were so exactly conformable to marine bodies, that they had all the accidental concretions growing to them, (such as pearls, corals, and smaller shells,) which are found in shells just gathered on the shore. They were, therefore, from these considerations, given back to the sea; but the wonder was, how to account for their coming so far from their own natural element upon land.†

As this naturally gave rise to many conjectures, it is not to be wondered that some among them have been very extraordinary. An Italian, quoted by Mr. Buffon, supposes them to have been deposited in the earth at the time of the crusades, by the pilgrims who returned from Jerusalem; who gathering them upon the sea-shore, in their return carried them to their different places of habitation. But this conjecturer seems to have but a very inadequate idea of their numbers. At Touraine, in France, more than a hundred miles from the sea, there is a plain of about nine leagues long, and as many broad, whence the peasants of the country supply themselves with marl for manuring their lands. They seldom dig deeper than twenty feet, and the whole plain is composed of the same materials, which are shells of various kinds, without the smallest portion of earth between them. Here then is a large space, in which are deposited millions of tons of shells, that pilgrims could not have collected, though their whole employment had been nothing else. England is furnished with its beds, which, though not quite so extensive, yet are equally wonderful. "Near Reading, in Berkshire, for many succeeding generations, a continued body of oyster-shells has been found through the whole circumference of five or six acres of ground. The foundation of these shells is a hard rocky chalk; and above this chalk, the oyster-shells lie in a bed of green sand, upon a level, as nigh as can possibly be judged, and about two feet in thickness."[*] These shells are in their natural state, but they are found also petrified, and almost in equal abundance[†] in all the Alpine rocks, in the Pyrenees, on the hills of France, England, and Flanders. Even in all quarries from whence marble is dug, if the rocks be split perpendicularly downwards, petrified shells and other marine substances will be plainly discerned.

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* Lowth's Abridgment. Phil. Trans. vol. ii. p. 426 † Woodward, p. 43

"About a quarter of a mile from the river Medway, in the county of Kent, after the taking off the coping of a piece of ground there, the workmen came to a blue marble, which continued for three feet and a half deep, or more, and then beneath appeared a hard floor, or pavement, composed of petrified shells crowded closely together. This layer was about an inch deep, and several yards over; and it could be walked upon as upon a beach. These stones, of which it was composed, (the describer supposes them to have always been stones,) were either wreathed as snails, or bivalvular like cockles. The wreathed kinds were about the size of a hazel-nut, and were filled with a stony substance of the colour of marl; and they themselves, also, till they were washed, were of the same colour: but when cleaned, they appeared of the colour of bezoar, and of the same polish. After boiling in water they became whitish, and left a chalkiness upon the fingers."[‡]

In several parts of Asia and Africa, travellers have observed these shells in great abundance. In the mountains of Castravan, which lie above the city Barut, they quarry out a white stone, every part of which contains petrified fishes in great numbers, and of surprising diversity. They also seem to continue in such preservation, that their fins, scales, and all the minutest distinctions of their make, can be perfectly discerned.[§]

From all these instances we may conclude, that fossils are very numerous; and, indeed, independent of their situation, they afford no small entertainment to observe them as preserved in the cabinets of the curious. The varieties of their kinds are astonishing. Most of the sea-shells which are known, and many others to which we are entirely strangers, are to be seen either in their natural state, or in various degrees of petrifaction.[||] In the place of some we have mere spar, or stone, exactly expressing all the lineaments of animals, as having been wholly formed from them. For it has happened, that the shells dissolving by very slow degrees, and the matter having nicely and exactly filled all the cavities within, this matter, after the shells have perished, has preserved exactly and regularly the whole print of their internal surface. Of these there are various kinds found in our pits; many of them resembling those of our own shores; and many others that are only to be found on the coasts of other countries. There are some shells resembling those that are never stranded upon our coasts,[¶] but always remain in the deep:[**] and many more there are which we can assimilate with no shells that are known amongst us. But we find not only shells in our pits, but also fishes and corals in great abundance; together with almost every sort of marine productions.

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[*] Phil. Trans. vol. ii. p. 427. [†] Buffon, vol. i. p. 407. [‡] Phil. Trans. p. 426

[§] Buffon. vol. i. p. 408. [||] Hill, p. 646. [¶] Littorales. [**] Pelagii

It is extraordinary enough, however, that the common red coral, though so very frequent at sea, is scarcely seen in the fossil world, nor is there any account of its having ever been met with. But to compensate for this, there are all the kinds of the white coral now known, and many other kinds of that substance with which we are unacquainted. Of animals there are various parts: the vertebræ of whales, and the mouths of lesser fishes; these, with teeth also of various kinds, are found in the cabinets of the curious; where they receive long Greek names, which it is neither the intention nor the province of this work to enumerate. Indeed, few readers would think themselves much improved, should I proceed with enumerating the various classes of Conicthyodontes, Polyleptoginglimi, or the Orthoceratites. These names, which mean no great matter when they are explained, may serve to guide in furnishing a cabinet; but they are of very little service in furnishing the page of instructive history.

From all these instances we see in what abundance petrifactions are to be found; and, indeed, Mr. Buffon, to whose accounts we have added some, has not been sparing in the variety of his quotations, concerning the places where they are mostly to be found. However, I am surprised that he should have omitted the mention of one, which, in some measure, more than any of the rest, would have served to strengthen his theory. We are informed, by almost every traveller,* that has described the pyramids of Egypt, that one of them is entirely built of a kind of free-stone, in which these petrified shells are found in great abundance. This being the case, it may be conjectured, as we have accounts of these pyramids among the earliest records of mankind, and of their being built so long before the age of Herodotus, who lived but fifteen hundred years after the flood, that even the Egyptian priests could tell neither the time nor the cause of their erection; I say, it may be conjectured that they were erected but a short time after the flood. It is not very likely, therefore, that the marine substances found in one of them, had time to be formed into a part of the solid stone, either during the deluge, or immediately after it; and, consequently, their petrifaction must have been before that period. And this is the opinion Mr. Buffon has so strenuously endeavoured to maintain; having given specious reasons to prove, that such shells were laid in the beds where they are now found, not only before the deluge, but even antecedent to the formation of man, at the time when the whole earth, as he supposes, was buried beneath a covering of waters.

But while there are many reasons to persuade us that these extraneous fossils have been deposited by the sea, there is one fact that will abundantly serve to convince us, that the earth was habitable, if not inhabited, before these marine substances came to be thus deposited. For we find fossil-trees, which no doubt once grew upon the earth, as deep, and as much in the body of solid rocks, as these shells are found to be. Some of these fallen trees also have lain at least as long, if not longer, in the earth, than the shells, as they have been found sunk deep in a marly substance, composed of decayed shells and other marine productions. Mr. Buffon has proved, that fossil-shells could not have been deposited in such quantities all at once by the flood; and I think, from the above instance, it is pretty plain, that, howsoever they were deposited, the earth was covered with trees before their deposition; and, consequently, that the sea could not have made a very permanent stay. How then shall we account for these extraordinary appearances in nature? A suspension of all assent is certainly the first, although the most mortifying conduct. For my own part, were I to offer a conjecture, and all that has been said upon this subject is but conjecture, instead of supposing them to be the remains of animals belonging to the sea, I would consider them rather as bred in the numerous fresh-water lakes, that, in primeval times, covered the face of uncultivated nature. Some of these shells we know to belong to fresh waters; some can be assimilated to none of the marine shells now known;[*] why, therefore, may we not as well ascribe the productions of all to fresh waters, where we do not find them, as we do that of the latter to the sea only, where we never find them? We know that lakes, and lands also, have produced animals that are now no longer existing; why, therefore, might not these fossil productions be among the number? I grant that this is making a very harsh supposition; but I cannot avoid thinking, that it is not attended with so many embarrassments as some of the former, and that it is much easier to believe that these shells were bred in fresh water, than that the sea had for a long time covered the tops of the highest mountains.

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* Hasselouist, Sandys.

CHAPTER VI.

OF THE INTERNAL STRUCTURE OF THE EARTH.

Having, in some measure, got free from the regions of conjecture, let us now proceed to a description of the earth as we find it by examination, and observe its internal composition, as far as it has been the subject of experience, or exposed to human inquiry. These inquiries, indeed, have been carried but to a very little depth below its surface, and even in that disquisition men have been conducted more by motives of avarice than of curiosity. The deepest mine, which is that of Cotteberg in Hungary,[†] reaches not more than three thousand feet deep; but what proportion does that bear to the depth of the terrestrial globe, down to the centre, which is above four thousand miles? All, therefore, that has been said of the earth, to a deeper degree, is merely fabulous or conjectural; we way suppose with one, that it is a globe of glass;[‡] with another, a sphere of heated iron;[§] with a third, a great mass of waters;[||] and with a fourth, one dreadful volcano;[¶] but let us at the same time show our consciousness, that all these are but suppositions.

Upon examining the earth, where it has been opened to any depth, the first thing that occurs, is the different layers or beds of which it is composed; these all lying horizontally one over the other, like the leaves of a book, and each of them composed of materials that increase in weight in proportion as they lie deeper. This is, in general, the disposition of the different materials, where the earth seems to have remained unmolested; but this order is frequently inverted; and we cannot tell whether from its original formation, or from accidental causes. Of different substances, thus disposed, the far greatest part of our globe consists, from its surface downwards to the greatest depths we ever dig or mine*.

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[*] Hill's Fossils, p. 641.
[†] Boyle, vol. iii. p. 240.
[‡] Buffon.
[§] Whiston.
[||] Burnet.
[¶] Kircher.

The first layer that is most commonly found at the surface, is that light coat of blackish mould, which is called by some *garden earth.* With this the earth is every where invested, unless it be washed off by rains, or removed by some other external violence. This seems to have been formed from animal and vegetable bodies decaying, and thus turning into its substance. It also serves again as a storehouse, from whence animal and vegetable nature are renewed, and thus are all vital blessings continued with unceasing circulation. This earth, however, is not to be supposed entirely pure, but is mixed with much stony and gravelly matter from the layers lying immediately beneath it. It generally happens, that the soil is fertile in proportion to the quantity that this putrified mould bears to the gravelly mixture; and as the former predominates, so far is the vegetation upon it more luxuriant. It is this external covering that supplies man with all the true riches he enjoys. He may bring up gold and jewels from greater depths; but they are merely the toys of a capricious being, things upon which he has placed an imaginary value, and for which fools alone part with the more substantial blessings of life. "It is this earth," says Pliny,† "that, like a kind mother, receives us at our birth, and sustains us when born. It is this alone, of all the elements around us, that is never found an enemy to man. The body of waters deluge him with rains, oppress him with hail, and drown him with inundations. The air rushes in storms, prepares the tempest, or lights up the volcano; but the earth, gentle and indulgent, ever subservient to the wants of man, spreads his walks with flowers, and his table with plenty; returns with interest every good committed to her care; and though she produces the poison, she still supplies the antidote; though constantly teazed more to furnish the luxuries of man than his necessities, yet, even to the last, she continues her kind indulgence, and, when life is over, she piously covers his remains in her bosom."

This external and fruitful layer which covers the earth, is, as was said, in a state of continual change. Vegetables, which are naturally fixed and rooted to the same place, receive their adventitious nourishment from the surrounding earth and water; animals, which change from place to place, are supported by these, or by each other. Both, however, having for a time enjoyed a life adapted to their nature, give back to the earth those spoils, which they had borrowed for a very short space, yet still to be quickened again into fresh existence. But the deposits they make are of very dissimilar kinds, and the earth is very differently enriched by their continuance: those countries that have for a long time supported men and other animals, having been observed to become every day more barren; while, on the contrary, those desolate places, in which vegetables only are abundantly produced, are known to be possessed of amazing fertility. "In regions which are uninhabited,"* says Mr. Buffon, "where the forests are not cut down, and where animals do not feed upon the plants, the bed of vegetable earth is constantly increasing. In all woods, and even in those which are often cut, there is a layer of earth of six or eight inches thick, which has been formed by the leaves, branches, and bark, which fall and rot upon the ground. I have frequently observed on a Roman way, which crosses Burgundy for a long extent, that there is a bed of black earth, of more than a foot thick, gathered over the stony pavement, on which several trees, of a very considerable size, are supported. This I have found to be nothing else than an earth formed by decayed leaves and branches, which have been converted by time into a black soil. Now as vegetables draw much more of their nourishment from the air and water than they do from the earth, it must follow, that in rotting upon the ground, they must give more to the soil than they have taken from it. Hence, therefore, in woods kept a long time without cutting, the soil below increases to a considerable depth; and such we actually find the soil in those American wilds, where the forests have been undisturbed for ages. But it is otherwise where men and animals have long subsisted; for as they make a considerable consumption of wood and plants, both for firing and other uses, they take more from the earth than they return to it; it follows, therefore, that the bed of vegetable earth, in an inhabited country, must be always diminishing; and must at length resemble the soil of Arabia Petrea, and other provinces of the East, which having been long inhabited, are now become plains of salt and sand; the fixed salt always remaining while the other volatile parts have flown away."

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* Woodward, p. 9.

† Plinii Naturalis Historia. lib. ii. cap. 63.

If from this external surface we descend deeper, and view the earth cut perpendicularly downwards, either in the banks of great rivers, or steepy sea-shores; or, going still deeper, if we observe it in quarries or mines, we shall find its layers regularly disposed in their proper order. We must not expect, however, to find them of the same kind or thickness in every place, as they differ in different soils and situations. Sometimes marl is seen to be over sand, and sometimes under it. The most common disposition is, that under the first earth is found gravel or sand, then clay or marl, then chalk or coal, marbles, ores, sands, gravels, and thus an alternation of these substances, each growing more dense as it sinks deeper. The clay, for instance, found at the depth of a hundred feet, is usually more heavy than that found not far from the surface. In a well which was dug at Amsterdam, to the depth of two hundred and thirty feet, the following substances were found in succession:† seven feet of vegetable earth, nine of turf, nine of soft clay, eight of sand, four of earth, ten of clay, four of earth, ten of sand, two of clay, four of white sand, one of soft earth, fourteen of sand, eight of clay mixed with sand, four of sea-sand mixed with shells, then a hundred and two feet of soft clay, and then thirty-one feet of sand.

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* Buffon, vol. i p. 353.

† Varenius, as quoted by Mr. Buffon, p. 358.

In a well dug at Marly, to the depth of a hundred feet, Mr. Buffon gives us a still more exact enumeration of its layers of earth. "Thirteen of a reddish gravel, two of gravel mingled with a vitrifiable sand, three of mud or slime, two of marl, four of marly stone, five of marl in dust mixed with vitrifiable sand, six of very fine vitrifiable sand, three of earthy marl, three of hard marl, one of gravel, one of eglantine, a stone of the hardness and grain of marble, one of gravelly marl, one of stony marl, one of a coarser kind of stony marl, two of a coarser kind still, one of vitrifiable sand mixed with fossil-shells, two of fine gravel, three of stony marl, one of coarse powdered marl, one of stone, calcinable like marble, three of gray sand, two of white sand, one of red sand streaked with white, eight of gray sand with shells, three of very fine sand, three of a hard gray stone, four of red sand streaked with white, three of white sand, and fifteen of reddish vitrifiable sand."

In this manner the earth is every where found in beds over beds; and, what is still remarkable, each of them, as far as it extends, always maintains exactly the same thickness. It is found also, that as we proceed to considerable depths, every layer grows thicker. Thus in the adduced instances we might have observed, that the last layer was fifteen feet thick, while most of the others were not above eight, and this might have gone much deeper, for ought we can tell, as before they got through it the workmen ceased digging.

These layers are sometimes very extensive, and often are found to spread over a space of some leagues in circumference. But it must not be supposed that they are uniformly continued over the whole globe without any interruption: on the contrary, they are ever, at small intervals, cracked through as it were by perpendicular fissures; the earth resembling, in this respect, the muddy bottom of a pond, from whence the water has been dried off by the sun, and thus gaping in several chinks, which descend in a direction perpendicular to its surface. These fissures are many times found empty, but oftener closed up with adventitious substances, that the rain, or some other accidental causes, have conveyed to fill their cavities. Their openings are not less different than their contents, some being not above half an inch wide, some a foot, and some several hundred yards asunder. These last form those dreadful chasms that are to be found in the Alps, at the edge of which the traveller stands dreading to look down at the immeasurable gulf below. These amazing clefts are well known to such as have passed these mountains, where a chasm frequently presents itself several hundred feet deep, and as many over, at the edge of which the way lies. It often happens also, that the road leads along the bottom, and then the spectator observes on each side frightful precipices several hundred yards above him; the sides of which correspond so exactly with each other, that they evidently seem torn asunder.

But these chasms, to be found in the Alps, are nothing to what Ovalle tells us are to be seen in the Andes. These amazing mountains, in comparison of which the former are but little hills, have their fissures in proportion to their greatness. In some places they are a mile wide, and deep in proportion; and there are some others, that, running under ground, in extent resemble a province.

Of this kind also is that cavern called *Eldenhole*, in Derbyshire, which Dr. Plott tells us, was sounded by a line of eight and twenty hundred feet, without finding the bottom, or meeting with water: and yet the mouth at the top is not above forty yards over.* This immeasurable cavern runs perpendicularly downward; and the sides of it seem to tally so plainly as to show that they once were united. Those who come to visit the place, generally procure stones to be thrown into its mouth; and these are heard for several minutes, falling and striking against the sides of the cavern, producing a sound that resembles distant thunder, dying away as the stone goes deeper.

Of this kind also is that dreadful cavern described by Ælian; his account of which the reader may not have met with.† "In the country of the Arrian Indians, is to be seen an amazing chasm, which is called, *The Gulf of Pluto.* The depth and the recesses of this horrid place, are as extensive as they are unknown. Neither the natives, nor the curious who visit it, are able to tell how it was first made, or to what depths it descends. The Indians continually drive thither great multitudes of animals, more than three thousand at a time, of different kinds, sheep, horses, and goats; and, with an absurd superstition, force them into the cavity, from whence they never return. Their several sounds, however, are heard as they descend; the bleating of sheep, the lowing of oxen, and the neighing of horses, issuing up to the mouth of the cavern. Nor do these sounds cease, as the place is continually furnished with a fresh supply."

There are many more of these dreadful perpendicular fissures in different parts of the earth; with accounts of which Kircher, Gaffarellus, and others who have given histories of the wonders of the subterranean world, abundantly supply us. The generality of readers, however, will consider them with less astonishment, when they are informed of their being common all over the earth; that in every field, in every quarry, these perpendicular fissures are to be found, either still gaping, or filled with matter that has accidentally closed their interstices. The inattentive spectator neglects the inquiry, but their being common is partly the cause that excites the philosopher's attention to them; the irregularities of nature he is often content to let pass unexamined; but when a constant and common appearance presents itself, every return of the object is a fresh call to his curiosity; and the chink in the next quarry becomes as great a matter of wonder as the chasm in Eldenhole. Philosophers have long, therefore, endeavoured to find out the cause of these perpendicular fissures, which our own countrymen, Woodward and Ray, were the first that found to be so common and universal. Mr. Buffon supposes them to be cracks made by the sun, in drying up the earth immediately after its emersion from the deep. The heat of the sun is very probably a principal cause; but it is not right to ascribe to one only, what we find may be the result of many. Earthquakes, severe frosts, bursting waters, and storms, tearing up the roots of trees, have, in our own times, pro duced them: and to this variety of causes, we, must, at present, be content to assign those that have happened before we had opportunities for observation.

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* Phil. Trans. vol. ii. p. 370. † Ælian, Var. Hist. lib. xvi. cap. 16

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CHAPTER VII.

OF CAVES AND SUBTERRANEOUS PASSAGES, THAT SINK, BUT NOT PERPENDICULARLY, INTO THE EARTH.

In surveying the subterranean wonders of the globe, besides those fissures that descend perpendicularly, we frequently find others that descend but a litle way, and then spread themselves often to a great extent below the surface. Many of these caverns, it must be confessed, may be the production of art and human industry; retreats made to protect the oppressed, or shelter the spoiler. The famous labyrinth of Candia, for instance, is supposed to be entirely the work of art. Mr. Tournefort assures us, that it bears the impression of human industry, and that great pains have been bestowed upon its formation. The stone-quarry of Maestricht is evidently made by labour: carts enter at its mouth, and load within, then return and discharge their freight into boats that lie on the brink of the river Maese. This quarry is so large, that forty thousand people may take shelter in it: and it in general serves for this purpose, when armies march that way; becoming then an impregnable retreat to the people that live thereabout. Nothing can be more beautiful than this cavern, when lighted up with torches; for there are thousands of square pillars, in large level walks, about twenty feet high; and all wrought with much neatness and regularity. In this vast grotto there is very little rubbish; which shows both the goodness of the stone, and the carefulness of the workmen. To add to its beauty, there also are, in various parts of it, little pools of water, for the convenience of the men and cattle. It is remarkable also, that no droppings are seen to fall from the roof, nor are the walks any way wet under foot, except in cases of great rains, where the water gets in by the air-shafts. The salt-mines in Poland are still more spacious than these. Some of the catacombs, both in Egypt and Italy, are said to be very extensive. But no part of the world has a greater number of artificial caverns than Spain, which were made to serve as retreats to the Christians against the fury of the Moors, when the latter conquered that country. However, an account of the works of art does not properly belong to a natural history. It will be enough to observe, that though caverns be found in every country, far the greatest part of them have been fashioned by the hand of nature only. Their size is found beyond the power of man to have effected, and their forms but ill adapted to the conveniences of a human habitation. In some places, indeed, we find mankind still make use of them as houses; particularly in those countries where the climate is very severe;* but in general they are deserted by every race of meaner animals, except the bat; these nocturnal solitary creatures are usually the only inhabitants; and these only in such whose descent is sloping, or, at least, not directly perpendicular.

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* Phil. Trans. vol. ii. p 368.

There is scarcely a country in the world without its natural caverns; and many new ones are discovered every day. Of those in England, Oakey-hole, the Devil's-hole, and Penpark-hole, have been often described. The former, which lies on the south side of Mendip-hills,* within a mile of the town of Wells, is much resorted to by travellers. To conceive a just idea of this, we must imagine a precipice of more than a hundred yards high, on the side of a mountain which shelves away a mile above it. In this is an opening not very large, into which you enter, going along upon a rocky uneven pavement, sometimes ascending, and sometimes descending. The roof of it, as you advance, grows higher: and, in some places, is fifty feet from the floor. In some places, however, it is so low that a man must stoop to pass. It extends itself, in length, about two hundred yards; and from every part of the roof, and the floor, there are formed sparry concretions of various figures, that by strong imaginations have been likened to men, lions, and organs. At the farthest part of this cavern rises a stream of water, well stored with fish, large enough to turn a mill, and which discharges itself near the entrance.

Penpark-hole, in Gloucestershire, is almost as remarkable as the former. Captain Sturmey descended into this by a rope, twenty-five fathoms perpendicular, and at the bottom found a very large vault in the shape of a horseshoe. The floors consisted of a kind of white stone enamelled with lead ore, and the pendent rocks were glazed with spar. Walking forward on this stony pavement, for some time, he came to a great river, twenty fathoms broad, and eight fathoms deep; and having been informed that it ebbed and flowed with the sea, he remained in this gloomy abode for five hours, to make an exact observation. He did not find, however, any alteration whatsoever in its appearance. But his curiosity was ill requited; for it cost this unfortunate gentleman his life: immediately after his return he was seized with an unusual and violent headach, which threw him into a fever, of which he died soon after.

But of all the subterranean caverns now known, the grotto of Antiparos is the most remarkable, as well for its extent, as for the beauty of its sparry incrustations. This celebrated cavern was first discovered by one Magni, an Italian traveller, about a hundred years ago, at Antiparos, an inconsiderable island of the Archipelago.† The account he gives of it is long and inflated, but upon the whole amusing. "Having been informed," says he, "by the natives of Paros, that in the little island of Antiparos, which lies about two miles from the former, of a gigantic statue that was to be seen at the mouth of a cavern in that place, it was resolved that we (the French consul and himself) should pay it a visit. In pursuance of this resolution, after we had landed on the island, and walked about four miles through the midst of beautiful plains, and sloping woodlands, we at length came to a little hill, on the side of which yawned a most horrid cavern, that with its gloom at first struck us with terror, and almost repressed curiosity. Recovering the first surprise, however, we entered boldly; and had not proceeded above twenty paces, when the supposed statue of the giant presented itself to our view. We quickly perceived, that what the ignorant natives had been terrified at as a giant, was nothing more than a sparry concretion, formed by the water dropping from the roof of the cave, and by degrees hardening into a figure that their fears had formed into a monster. Incited by this extraordinary appearance, we were induced to proceed still farther, in quest of new adventures in this subterranean abode. As we proceeded, new wonders offered themselves; the spars, formed into trees and shrubs, presented a kind of petrified grove; some white, some green; and all receding in due perspective. They struck us with the more amazement, as we knew them to be mere productions of nature, who, hitherto in solitude, had, in her playful moments, dressed the scene as if for her own amusement.

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* Phil. Trans. vol. ii. p. 368.

† Kircher Mund. sub. 112. I have translated a part of Kircher's description, rather tha Tournefort's, as the latter was written to support a hypothesis.

"But we had as yet seen but a few of the wonders of the place; and were introduced only into the portico of this amazing temple. In one corner of this half-illuminated recess, there appeared an opening of about three feet wide, which seemed to lead to a place totally dark, and that, one of the natives assured us, contained nothing more than a reservoir of water. Upon this we tried, by throwing down some stones, which rumbled along the sides of the descent for some time, the sound seemed at last quashed in a bed of water. In order, however, to be more certain, we sent in a Levantine mariner, who, by the promise of a good reward, with a flambeau in his hand, ventured into this narrow aperture. After continuing within it for about a quarter of an hour, he returned, carrying some beautiful pieces of white spar in his hand, which art could neither imitate nor equal. Upon being informed by him that the place was full of these beautiful incrustations, I ventured in once more with him for about fifty paces, anxiously and cautiously descending by a steep and dangerous way. Finding, however, that we came to a precipice which led into a spacious amphitheatre, if I may so call it, still deeper than any other part, we returned, and being provided with a ladder, flambeaux, and other things to expedite our descent, our whole company, man by man, ventured into the same opening, and descending one after another, we at last saw ourselves all together in the most magnificent part of the cavern.

"Our candles being now all lighted up, and the whole place completely illuminated, never could the eye be presented with a more glittering, or a more magnificent scene. The roof all hung with solid icicles, transparent as glass, yet solid as marble. The eye could scarcely reach the lofty and noble ceiling: the sides were regularly formed with spars; and the whole presented the idea of a magnificent theatre, illuminated with an immense profusion of lights. The floor consisted of solid marble; and in several places magnificent columns, thrones, altars, and other objects, appeared, as if nature had designed to mock the curiosities of art. Our voices, upon speaking or singing, were redoubled to an astonishing loudness; and upon the firing of a gun, the noise and reverberations were almost deafening. In the midst of this grand amphitheatre rose a concretion of about fifteen feet high, that, in some measure, resembled an altar; from which taking the hint, we caused mass to be celebrated there. The beautiful columns that shot up round the altar, appeared like candlesticks; and many other natural objects represented the customary ornaments of this sacrament.

"Below even this spacious grotto there seemed another cavern; down which I ventured with my former mariner, and descended about fifty paces by means of a rope. I at last arrived at a small spot of level ground, where the bottom appeared different from that of the amphitheatre, being composed of soft clay, yielding to the pressure, and in which I thrust a stick to about six feet deep. In this however, as above, numbers of the most beautiful crystals were formed; one of which particularly resembled a table. Upon our egress from this amazing cavern, we perceived a Greek inscription upon a rock at the mouth, but so obliterated by time, that we could not read it. It seemed to import that one Antipater, in the time of Alexander, had come thither; but whether he had penetrated into the depths of the cavern, he does not think fit to inform us."

Such is the account of this beautiful scene, as communicated in a letter to Kircher. We have another, and a more copious description of it, by Tournefort, which is in every body's hands; but I have given the above, both because it was communicated by the first discoverer, and because it is a simple narrative of facts, without any reasoning upon them. According to Tournefort's account, indeed, we might conclude, from the rapid growth of the spars in this grotto, that it must every year be growing narrower, and that it must in time be choked up with them entirely; but no such thing has happened hitherto, and the grotto at this day continues as spacious as we ever knew it.

This is not a place for an inquiry into the seeming vegetation of those stony substances, with which this and almost every cavern are incrusted; it is enough to observe in general, that they are formed by an accumulation of that little gritty matter, which is carried thither by the waters, and which in time acquires the hardness of marble. What in this place more imports us to know is, how these amazing hollows in the earth came to be formed. And I think, in the three instances above mentioned, it is pretty evident, that their excavation has been owing to water. These, finding subterraneous passages under the earth, and by long degrees hollowing the beds in which they flowed, the ground above them has slipped down closer to their surface, leaving the upper layers of the earth or stone still suspended: the ground that sinks upon the face of the waters forming the floor of the cavern; the ground, or rock, that keeps suspended, forming the roof: and indeed there are but few of these caverns found without water, either within them, or near enough to point out their formation.

CHAPTER VIII.

OF MINES, DAMPS, AND MINERAL VAPOURS.

THE caverns, which we have been describing, generally carry us but a very little way below the surface of the earth. Two hundred feet, at the utmost, is as much as the lowest of them is found to sink. The perpendicular fissures run much deeper; but few persons have been bold enough to venture down to their deepest recesses; and some few who have tried, have been able to bring back no tidings of the place, for unfortunately they left their lives below. The excavations of art have conducted us much further into the bowels of the globe. Some mines in Hungary are known to be a thousand yards perpendicularly downwards; and I have been informed, by good authority, of a coal mine in the north of England, a hundred yards deeper still.

It is beside our present purpose to inquire into the peculiar construction and contrivance of these, which more properly belongs to the history of fossils. It will be sufficient to observe in this place, that as we descend into the mines, the various layers of earth are seen as we have already described them; and in some of these are always found the metals or minerals for which the mine has been dug. Thus frequently gold is found dispersed and mixed with clay and gravel;* sometimes it is mixed with other metallic bodies, stones, or bitumens;† and sometimes united with that most obstinate of all substances, platina, from which scarce any art can separate it. Silver is sometimes found quite pure,‡ sometimes mixed with other substances and minerals. Copper is found in beds mixed with various substances, marbles, sulphurs, and pyrites. Tin, the ore of which is heavier than that of any other metal, is generally found mixed with every kind of matter:§ lead is also equally common; and iron we well know can be extracted from all the substances upon earth.

The variety of substances which are thus found in the bowels of the earth, in their native state, have a very different appearance from what they are afterwards taught to assume by human industry. The richest metals are very often less glittering and splendid than the most useless marcasites; and the basest ores are in general the most beautiful to the eye.

This variety of substances, which compose the internal parts of our globe, is productive of equal varieties, both above and below its surface. The combination of the different minerals with each other, the heats which arise from their mixture, the vapours they diffuse, the fires which they generate, or the colds which they sometimes produce, are all either noxious or salutary to man; so that in this great elaboratory of nature, a thousand benefits and calamities are forging, of which we are wholly unconscious; and it is happy for us that we are so.

Upon our descent into mines of considerable depth, the cold seems to increase from the mouth as we descend;|| but after passing very low down, we begin by degrees to come into a warmer air, which sensibly grows hotter as we go deeper, till, at last, the labourers can scarce bear any covering as they continue working.

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* Ulloa, vol. ii. p. 470. † Ulloa, ibid. ‡ Macquer's Chymistry, vol. i. p. 316.
§ Hill's Fossils, p. 628. || Boyle, vol. iii. p. 232.

This difference in the air was supposed by Boyle to proceed from magazines of fire that lay nearer the centre, and that diffused their heat to the adjacent regions. But we now know that it may be ascribed to more obvious causes. In some mines, the composition of the earth all around is of such a nature, that upon the admission of water or air, it frequently becomes hot, and often bursts out into eruptions. Besides this, as the external air cannot readily reach the bottom, or be renewed there, an observable heat is perceived below, without the necessity of recurring to the central heat for an explanation.

Hence, therefore, there are two principal causes of the warmth at the bottom of mines: the heat of the substances of which the sides are composed; and the want of renovation in the air below. Any sulphureous substance, mixed with iron, produces a very great heat, by the admission of water. If, for instance, a quantity of sulphur be mixed with a proportionable share of iron filings, and both kneaded together into a soft paste, with water, they will soon grow hot, and at last produce a flame. This experiment, produced by art, is very commonly effected within the bowels of the earth by nature. Sulphurs and irons are intimately blended together, and want only the mixture of water or air to excite their heat; and this, when once raised, is communicated to all bodies that lie within the sphere of their operation. Those beautiful minerals called *marcasites* and *pyrites*, are often of this composition; and wherever they are found, either by imbibing the moisture of the air, or having been by any means combined with water, they render the mine considerably hot.*

The want of fresh air also, at these depths, is, as we have said, another reason for their being found much hotter. Indeed, without the assistance of art, the bottom of most mines would, from this cause, be insupportable. To remedy this inconvenience, the miners are often obliged to sink, at some convenient distance from the mouth of the pit, where they are at work, another pit, which joins the former below, and which, in Derbyshire, is called an *air-shaft*. Through this the air circulates; and thus the workmen are enabled to breathe freely at the bottom of the place; which becomes, as Mr. Boyle affirms, very commodious for respiration, and also very temperate as to heat and cold.† Mr. Locke, however, who has left us an account of the Mendip mines, seems to present a different picture. "The descent into these is exceedingly difficult and dangerous; for they are not sunk like wells, perpendicularly, but as the crannies of the rocks happen to run. The constant method is to swing down by a rope placed under the arms, and clamber along by applying both feet and hands to the sides of the narrow passage. The air is conveyed into them through a little passage that runs along the sides from the top, where they set up some turfs, on the lea-side of the hole, to catch and force it down. These turfs being removed to the windy side, or laid over the mouth of the hole, the miners below presently want breath, and faint; and if sweet-smelling flowers chance to be placed there, they immediately lose their fragrancy, and stink like carrion." An air so putrifying can never be very commodious for respiration.

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* Kircher Mund. Subt. vol. ii. p. 216.

† Boyle, vol. iii. p. 238.

Indeed, if we examine the complexion of most miners, we shall be very well able to form a judgment of the unwholesomeness of the place where they are confined. Their pale and sallow looks show how much the air is damaged by passing through those deep and winding ways, that are rendered humid by damps, or warmed with noxious exhalations. But although every mine is unwholesome, all are not equally so. Coal-mines are generally less noxious than those of tin; tin than those of copper; but of all, none are so dreadfully destructive as those of quicksilver. At the mines near the village of Idra, nothing can adequately describe the deplorable infirmities of such as fill the hospital there; emaciated and crippled, every limb contracted or convulsed, and some in a manner transpiring quicksilver at every pore. There was one man, says Dr. Pope,* who was not in the mines above half a year, and yet whose body was so impregnated with this mineral, that putting a piece of brass money in his mouth, or rubbing it between his fingers, it immediately became as white as if it had been washed over with quicksilver. In this manner all the workmen are killed sooner or later; first becoming paralytic, and then dying consumptive: and all this they sustain for the trifling reward of sevenpence a day.

But these metallic mines are not so noxious from their own vapours, as from those of the substances with which the ores are usually united, such as arsenic, cinnabar, bitumen, or vitriol. From the fumes of these, variously combined, and kept inclosed, are produced those various damps, that put on so many dreadful forms, and are usually so fatal. Sometimes those noxious vapours are perceived by the delightful fragrance of their smell,† somewhat resembling the pea-blossom in bloom, from whence one kind of damp has its name. The miners are not deceived, however, by its flattering appearances, but as they thus have timely notice of its coming, they avoid it while it continues, which is generally during the whole summer season. Another shows its approach by the burning of the candles, which seem to collect their flame into a globe of light, and thus gradually lessen, till they are quite extinguished. From this also, the miners frequently escape; however, such as have the misfortune to be caught in it, either swoon away, and are suffocated, or slowly recover in excessive agonies. Here also is a third, called *the fulminating damp*, much more dangerous than either of the former, as it strikes down all before it like a flash of gunpowder, without giving any warning of its approach. But there is still another, more deadly than all the rest, which is found in those places where the vapour has been long confined, and has been, by some accident, set free. The air rushing out from thence, always goes upon deadly errands; and scarce any escape to describe the symptoms of its operations.

Some colliers in Scotland, working near an old mine that had been long closed up, happened, inadvertently, to open a hole into it, from the pit where they were then employed. By great good fortune, they at that time perceived their error, and instantly fled for their lives. The next day, however, they were resolved to renew their work in the same pit, and eight of them ventured down, without any great apprehensions; but they had scarce got to the bottom of the stairs that led to the pit, when, coming within the vapour, they all instantly dropped down dead, as if they had been shot. Amongst these unfortunate poor men, there was one whose wife was informed he was stifled in the mine; and, as he happened to be next the entrance, she so far ventured down as to see where he lay. As she approached the place, the sight of her husband inspired her with a desire to rescue him, if possible, from that dreadful situation; though a little reflection might have shown her it was then too late. But nothing could deter her; she ventured forward, and had scarce touched him with her hand, when the damp prevailed, and the misguided, but faithful creature, fell dead by his side.

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* Phil. Trans. vol. ii. p. 578. † Phil. Trans. vol. ii. p. 378

Thus the vapours found beneath the surface of the earth, are very various in their effects upon the constitution: and they are not less in their appearances. There are many kinds that seemingly are no way prejudicial to health, but in which the workmen breathe freely; and yet in these, if a lighted candle be introduced, they immediately take fire, and the whole cavern at once becomes one furnace of flame. In mines, therefore, subject to damps of this kind, they are obliged to have recourse to a very peculiar contrivance to supply sufficient light for their operations. This is by a great wheel; the circumference of which is beset with flints, which, striking against steels placed for that purpose at the extremity, a stream of fire is produced, which affords light enough, and yet which does not set fire to the mineral vapour.

Of this kind are the vapours of the mines about Bristol: on the contrary, in other mines, a single spark struck out from the collision of flint and steel, would set the whole shaft in a flame. In such, therefore, every precaution is used to avoid collision; the workmen making use only of wooden instruments in digging; and being cautious, before they enter the mine, to take out even the nails from their shoes. Whence this strange difference should arise, that the vapours of some mines catch fire with a spark, and others only with a flame, is a question that we must be content to leave in obscurity, till we know more of the nature both of mineral vapour and of fire. This only we may observe, that gunpowder will readily fire with a spark, but not with the flame of a candle: on the other hand, spirits of wine will flame with a candle, but not with a spark; but even here the cause of this difference as yet remains a secret.

As from this account of mines, it appears that the internal parts of the globe are filled with vapours of various kinds, it is not surprising that they should, at different times, reach the surface, and there put on various appearances. In fact, much of the salubrity, and much of the unwholesomeness of climates and soils, is to be ascribed to these vapours, which make their way from the bowels of the earth upwards, and refresh or taint the air with their exhalations. San mines, being naturally cold,* send forth a degree of coldness to the external air, to comfort and refresh it: on the contrary, metallic mines are known, not only to warm it with their exhalations, but often to destroy all kinds of vegetation by their volatile, corrosive fumes. In some mines dense vapours are plainly perceived issuing from their mouths, and sensibly warm to the touch. In some places, neither snow nor ice will continue on the ground that covers a mine; and over others the fields are found destitute of verdure.† The inhabitants, also, are rendered dreadfully sensible of these subterraneous exhalations, being affected with such a variety of evils proceeding entirely from this cause, that books have been professedly written upon this class of disorders.

Nor are these vapours, which thus escape to the surface of the earth, entirely unconfined; for they are frequently, in a manner, circumscribed to a spot. The grotto Del Cane, near Naples, is an instance of this; the noxious effects of which have made that cavern so very famous. This grotto, which has so much employed the attention of travellers, lies within four miles of Naples, and is situated near a large lake of clear and wholesome water.‡ Nothing can exceed the beauty of the landscape which this lake affords; being surrounded with hills covered with forests of the most beautiful verdure, and the whole bearing a kind of amphitheatrical appearance. However, this region, beautiful as it appears, is almost entirely uninhabited; the few peasants that necessity compels to reside there, looking quite consumptive and ghastly, from the poisonous exhalations that rise from the earth. The famous grotto lies on the side of a hill, near which place a peasant resides, who keeps a number of dogs for the purpose of showing the experiment to the curious. These poor animals always seem perfectly sensible of the approach of a stranger, and endeavour to get out of the way. However, their attempts being perceived, they are taken and brought to the grotto; the noxious effects of which they have so frequently experienced. Upon entering this place, which is a little cave, or hole rather, dug into the hill, about eight feet high, and twelve feet long, the observer can see no visible mark of its pestilential vapour; only to about a foot from the bottom, the wall seems to be tinged with a colour resembling that which is given by stagnant waters. When the dog, this poor philosophical martyr, as some have called him, is held above this mark, he does not seem to feel the smallest inconvenience; but when his head is thrust down lower, he struggles to get free for a little; but in the space of four or five minutes he seems to lose all sensation, and is taken out seemingly without life. Being plunged in the neighbouring lake, he quickly recovers, and is permitted to run home, seemingly without the smallest injury

This vapour, which thus for a time suffocates, is of the humid kind, as it extinguishes a torch, and sullies a looking-glass; but there are other vapours perfectly inflammable, and that only require the approach of a candle to set them blazing. Of this kind was the burning well at Brosely, which is now stopped up; the vapour of which, when a candle was brought within about a foot of the surface of the water, caught flame like spirit of wine, and continued blazing for several hours after. Of this kind, also, are the perpetual fires in the kingdom of Persia. In that province, where the worshippers of fire hold their chief mysteries, the whole surface of the earth, for some extent, seems impregnated with inflammable vapours. A reed stuck into the ground continues to burn like a flambeau; a hole made beneath the surface of the earth, instantly becomes a furnace, answering all the purposes of a culinary fire. There they make lime by merely burying the stones in the earth, and watch with veneration the appearances of a flame that has not been extinguished for times immemorial. How different are men in various climates! This deluded people worship the vapours as a deity, which, in other parts of the world are considered as one of the greatest evils.

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* Phil. Trans. vol. ii. p. 523.

† Boyle, vol. iii. p. 298

‡ Kircher, Mund. Subt. vol. i. p. 191.

CHAPTER IX.

OF VOLCANOES AND EARTHQUAKES.

Mines and caverns, as we have said, reach but a very little way under the surface of the earth, and we have hitherto had no opportunities of exploring farther. Without all doubt, the wonders that are still unknown surpass those that have been represented, as there are depths of thousands of miles which are hidden from our inquiry. The only tidings we have from these unfathomable regions are by means of volcanoes, those burning mountains that seem to discharge their materials from the lowest abysses of the earth.* A volcano may be considered as a cannon of immense size, the mouth of which is often near two miles in circumference. From this dreadful aperture are discharged torrents of flame and sulphur, and rivers of melted metal. Whole clouds of smoke and ashes, with rocks of enormous size, are discharged to many miles distance; so that the force of the most powerful artillery, is but as a breeze agitating a feather in comparison. In the deluge of fire and melted matter which runs down the sides of the mountain, whole cities are sometimes swallowed up and consumed. Those rivers of liquid fire are sometimes two hundred feet deep; and when they harden, frequently form considerable hills. Nor is the danger of these confined to the eruption only; but the force of the internal fire struggling for vent, frequently produces earthquakes through the whole region where the volcano is situated. So dreadful have been these appearances, that men's terrors have added new horrors to the scene, and they have regarded as prodigies, what we know to be the result of natural causes. Some philosophers have considered them as vents communicating with the fires of the centre; and the ignorant, as the mouths of hell itself. Astonishment produces fear, and fear superstition: the inhabitants of Iceland believe the bellowings of Hecla are nothing else but the cries of the damned, and that its eruptions are contrived to increase their tortures.

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* Buffon, vol. i. p. 291.

But if we regard this astonishing scene of terror with a more tranquil and inquisitive eye, we shall find that these conflagrations are produced by very obvious and natural causes. We have already been apprised of the various mineral substances in the bosom of the earth, and their aptness to burst out into flames. Marcasites and pyrites, in particular, by being humified with water or air, contract this heat, and often endeavour to expand with irresistible explosion. These, therefore, being lodged in the depths of the earth, or in the bosom of mountains, and being either washed by the accidental influx of waters below, or fanned by air, insinuating itself through perpendicular fissures from above, take fire at first by only heaving in earthquakes, but at length by bursting through every obstacle, and making their dreadful discharge in a volcano.

These volcanoes are found in all parts of the earth: in Europe there are three that are very remarkable: Ætna in Sicily, Vesuvius in Italy, and Hecla in Iceland. Ætna has been a volcano for ages immemorial. Its eruptions are very violent, and its discharge has been known to cover the earth sixty-eight feet deep. In the year 1537, an eruption of this mountain produced an earthquake through the whole island for twelve days, overturned many houses, and at last formed a new aperture, which overwhelmed all within five leagues round. The cinders thrown up were driven even into Italy, and its burnings were seen at Malta at the distance of sixty leagues. "There is nothing more awful," says Kircher, "than the eruptions of this mountain, nor nothing more dangerous than attempting to examine its appearances, even long after the eruption has ceased. As we attempt to clamber up its steepy sides, every step we take upward, the feet sink back half way. Upon arriving near the summit, ashes and snow, with an ill-assorted conjunction, present nothing but objects of desolation. Nor is this the worst, for, as all places are covered over, many caverns are entirely hidden from the sight, into which if the inquirer happens to fall, he sinks to the bottom, and meets inevitable destruction. Upon coming to the edge of the great crater, nothing can sufficiently represent the tremendous magnificence of the scene. A gulf two miles over, and so deep that no bottom can be seen; on the sides pyramidical rocks starting out between apertures that emit smoke and flame; all this accompanied with a sound that never ceases, louder than thunder, strikes the bold with horror, and the religious with veneration for HIM that has power to control its burnings."

In the descriptions of Vesuvius, or Hecla, we shall find scarcely any thing but a repetition of the same terrible objects, but rather lessened, as these mountains are not so large as the former. The crater of Vesuvius is but a mile across, according to the same author; whereas that of Ætna is two. On this particular, however, we must place no dependence, as these caverns every day alter; being lessened by the mountain's sinking at one eruption, and enlarged by the fury of another. It is not one of the least remarkable particulars respecting Vesuvius, that Pliny the naturalist was suffocated in one of its eruptions; for his curiosity impelling him too near, he found himself involved in smoke and cinders when it was too late to retire; and his companions hardly escaped to give an account of the misfortune. It was in that dread ful eruption that the city of Herculaneum was overwhelmed; the ruins of which have lately been discovered at sixty feet distance below the surface, and, what is still more remarkable, forty feet below the bed of the sea. One of the most remarkable eruptions of this mountain was in the year 1707, which is finely described by Valetta; a part of whose description I shall beg leave to translate.

"Towards the latter end of summer, in the year 1707, the Mount Vesuvius, that had for a long time been silent, now began to give some signs of commotion. Little more than internal murmurs at first were heard, that seemed to contend within the lowest depths of the mountain; no flame, nor even any smoke, was as yet seen. Soon after some smoke appeared by day, and a flame by night, which seemed to brighten all the campania. At intervals, also, it shot off substances with a sound very like that of artillery, but which, even at so great a distance as we were at, infinitely exceeded them in greatness. Soon after it began to throw up ashes, which becoming the sport of the winds, fell at great distances, and some many miles. To this succeeded showers of stones, which killed many of the inhabitants of the valley, but made a dreadful ravage among the cattle. Soon after a torrent of burning matter began to roll down the sides of the mountain, at first with a slow and gentle motion, but soon with increased celerity. The matter thus poured out, when cold, seemed upon inspection to be of vitrified earth, the whole united into a mass of more than stony hardness. But what was particularly observable was, that upon the whole surface of these melted materials, a light spongy stone seemed to float, while the lower body was of the hardest substance of which our roads are usually made. Hitherto there were no appearances but what had been often remarked before; but on the third or fourth day, seeming flashes of lightning were shot forth from the mouth of the mountain, with a noise far exceeding the loudest thunder. These flashes, in colour and brightness, resembled what we usually see in tempests, but they assumed a more twisted and serpentine form. After this followed such clouds of smoke and ashes, that the whole city of Naples, in the midst of the day, was involved in nocturnal darkness, and the nearest friends were unable to distinguish each other in this frightful gloom. If any person attempted to stir out without torchlight, he was obliged to return, and every part of the city was filled with supplications and terror. At length, after a continuance of some hours, about one o'clock at midnight, the wind blowing from the north, the stars began to be seen; the heavens, though it was night, began to grow brighter; and the eruptions, after a continuance of fifteen days, to lessen. The torrent of melted matter was seen to extend from the mountain down to the shore; the people began to return to their former dwellings, and the whole face of nature to resume its former appearance."

The famous Bishop Berkeley gives an account of one of these eruptions in a manner something different from the former.* "In the year 1717, and the middle of April, with much difficulty I reached the top of Mount Vesuvius, in which I saw a vast aperture full of smoke which hindered me from seeing its depth and figure. I heard within that horrid gulf certain extraordinary sounds, which seemed to proceed from the bowels of the mountain; a sort of murmuring, sighing, dashing sound; and, between whiles, a noise like that of thunder or cannon, with a clattering like that of tiles falling from the tops of houses into the streets. Sometimes, as the wind changed, the smoke grew thinner, discovering a very ruddy flame, and the circumference of the crater stroaked with red and several shades of yellow. After an hour's stay, the smoke, being moved by the wind, gave us short and partial prospects of the great hollow; in the flat bottom of which I could discern two furnaces almost contiguous; that on the left seeming about three yards over, glowing with ruddy flame, and throwing up red-hot stones with a hideous noise, which, as they fell back, caused the clattering already taken notice of.—May 8, in the morning, I ascended the top of Vesuvius a second time, and found a different face of things. The smoke ascending upright, gave a full prospect of the crater, which, as I could judge, was about a mile in circumference, and a hundred yards deep. A conical mount had been formed, since my last visit, in the middle of the bottom, which I could see was made by the stones, thrown up and fallen back again into the crater In this new hill remained the two furnaces already mentioned. The one was seen to throw up every three or four minutes, with a dreadful sound, a vast number of red-hot stones, at least three hundred feet higher than my head, as I stood upon the brink; but as there was no wind, they fell perpendicularly back from whence they had been discharged. The other was filled with red-hot liquid matter, like that in the furnace of a glass-house, raging and working like the waves of the sea, with a short abrupt noise. This matter would sometimes boil over, and run down the side of the conical hill, appearing at first red-hot, but changing colour as it hardened and cooled. Had the wind driven in our faces, we had been in no small danger of stifling by the sulphureous smoke, or being killed by the masses of melted minerals that were shot from the bottom. But as the wind was favourable, I had an opportunity of surveying this amazing scene for above an hour and a half together. On the fifth of June, after a horrid noise, the mountain was seen at Naples to work over; and about three days after, its thunders were renewed so, that not only the windows in the city, but all the houses, shook. From that time it continued to overflow, and sometimes at night were seen columns of fire shooting upward from its summit. On the tenth, when all was thought to be over, the mountain again renewed its terrors, roaring and raging most violently. One cannot form a juster idea of the noise, in the most violent fits of it, than by imagining a mixed sound made up of the raging of a tempest, the murmur of a troubled sea, and the roaring of thunder and artillery confused all together. Though we heard this at the distance of twelve miles, yet it was very terrible. I therefore resolved to approach nearer to the mountain; and, accordingly, three or four of us got into a boat, and were set ashore at a little town situated at the foot of the mountain. From thence we rode about four or five miles, before we came to the torrent of fire that was descending from the side of the volcano; and here the roaring grew exceedingly loud and terrible as we approached. I observed a mixture of colours in the cloud, above the crater, green, yellow, red, and blue. There was likewise a ruddy dismal light in the air, over that tract where the burning river flowed. These circumstances, set off and augmented by the horror of the night, made a scene the most uncommon and astonishing I ever saw; which still increased as we approached the burning river. Imagine a vast torrent of liquid fire, rolling from the top, down the side of the mountain, and with irresistible fury bearing down and consuming vines, olives, and houses; and divided into different channels, according to the inequalities of the mountain. The largest stream seemed half a mile broad at least, and five miles long. I walked so far before my companions up the mountain, along the side of the river of fire, that I was obliged to retire in great haste, the sulphureous steam having surprised me, and almost taken away my breath. During our return, which was about three o'clock in the morning, the roaring of the mountain was heard all the way, while we observed it throwing up huge spouts of fire and burning stones, which falling, resembled the stars in a rocket. Sometimes I observed two or three distinct columns of flame, and sometimes one only that was large enough to fill the whole crater. These burning columns, and fiery stones, seemed to be shot a thousand feet perpendicular above the summit of the volcano; and in this manner the mountain continued raging for six or eight days after. On the 18th of the same month, the whole appearance ended, and the mountain remained perfectly quiet, without any visible smoke or flame."

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* Phil. Trans. vol. ii. p. 203.

The matter which is found to roll down from the mouth of all volcanoes in general, resembles the dross that is thrown from a smith's forge. But it is different, perhaps, in various parts of the globe; for, as we have already said, there is not a quarter of the world that has not its volcanoes. In Asia, particularly in the islands of the Indian Ocean, there are many. One of the most famous is that of Albouras, near Mount Taurus, the summit of which is continually on fire, and covers the whole adjacent country with ashes. In the island of Ternate there is a volcano, which, some travellers assert, burns most furiously in the times of the equinoxes, because of the winds which then contribute to increase the flames. In the Molucca islands, there are many burning mountains; they are also seen in Japan, and the islands adjacent; and in Java and Sumatra, as well as in other of the Philippine islands. In Africa there is a cavern, near Fez, which continually sends forth either smoke or flames. In the Cape de Verde islands, one of them, called *the Island del Fuego*, continually burns; and the Portuguese, who frequently attempted a settlement there, have as often been obliged to desist. The Peak of Teneriffe is, as every body knows, a volcano, that seldom desists from eruptions. But of all parts of the earth, America is the place where those dreadful irregularities of nature are the most conspicuous. Vesuvius, and Ætna itself, are but mere fire-works in comparison to the burning mountains of the Andes; which, as they are the highest mountains of the world, so also are they the most formidable for their eruptions. The mountain of Arequipa in Peru, is one of the most celebrated; Tarassa, and Malahallo, are very considerable; but that of Cotopaxi, in the province of Quito, exceeds any thing we have hitherto read or heard of. The mountain of Cotopaxi, as described by Ulloa,* is more than three miles perpendicular from the sea; and it became a volcano at the time of the Spaniards' first arrival in that country. A new eruption of it happened in the year 1743, having been some days preceded by a continual roaring in its bowels. The sound of one of these mountains is not, like that of the volcanoes in Europe, confined to a province, but is heard at a hundred and fifty miles distance.† "An aperture was made in the summit of this immense mountain; and three more about equal heights, near the middle of its declivity, which was at that time buried under prodigious masses of snow. The ignited substances ejected on that occasion, mixed with a prodigious quantity of ice and snow, melting amidst the flames, were carried down with such astonishing rapidity, that in an instant the valley from Callo to Latacunga was overflowed; and besides its ravages in bearing down the houses of the Indians, and other poor inhabitants, great numbers of people lost their lives. The river of Latacunga was the channel of this terrible flood; till being too small for receiving such a prodigious current, it overflowed the adjacent country, like a vast lake near the town, and carried away all the buildings within its reach. The inhabitants retired into a spot of higher ground behind the town, of which those parts which stood within the limits of the current were totally destroyed. The dread of still greater devastations did not subside for three days; during which the volcano ejected cinders, while torrents of melted ice and snow poured down its sides. The eruption lasted several days, and was accompanied with terrible roarings of the wind, rushing through the volcano, still louder than the former rumblings in its bowels. At last all was quiet, neither fire nor smoke to be seen, nor noise to be heard; till, in the ensuing year, the flames again appeared with recruited violence, forcing their passage through several other parts of the mountain, so that in clear nights the flames being reflected by the transparent ice, formed an awfully magnificent illumination."

Such is the appearance and the effect of those fires which proceed from the more inward recesses of the earth: for that they generally come from deeper regions than man has hitherto explored, I cannot avoid thinking, contrary to the opinion of Mr. Buffon, who supposes them rooted but a very little way below the bed of the mountain. "We can never suppose," says this great naturalist, "that these substances are ejected from any great distance below, if we only consider the great force already required to fling them up to such vast heights above the mouth of the mountain; if we consider the substances thrown up, which we shall find upon inspection to be the same with those of the mountain below; if we take into our consideration, that air is always necessary to keep up the flame; but, most of all, if we attend to one circumstance, which is, that if these substances were exploded from a vast depth below, the same force required to shoot them up so high, would act against the sides of the volcano, and tear the whole mountain in pieces." To all this specious reasoning, particular answers might be easily given; as, that the length of the funnel increases the force of the explosion; that the sides of the funnel are actually often burst with the great violence of the flame; that air may be supposed at depths at least as far as the perpendicular fissures descend. But the best answer is a well-known fact; namely, that the quantity of matter discharged from Ætna alone, is supposed, upon a moderate computation, to exceed twenty times the original bulk of the mountain.[*] The greatest part of Sicily seems covered with its eruptions. The inhabitants of Catanea have found, at the distance of several miles, streets and houses sixty feet deep, overwhelmed by the lava or matter it has discharged. But what is still more remarkable, the walls of these very houses have been built of materials evidently thrown up by the mountain. The inference from all this is very obvious; that the matter thus exploded cannot belong to the mountain itself, otherwise it would have been quickly consumed; it cannot be derived from moderate depths, since its amazing quantity evinces, that all the places near the bottom must have long since been exhausted; nor can it have an extensive, and, if I may so call it, a superficial spread, for then the country round would be quickly undermined; it must, therefore, be supplied from the deeper regions of the earth; those undiscovered tracts where the Deity performs his wonders in solitude, satisfied with self-approbation!

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* Ulloa, vol. i. p. 442. † Ulloa, vol. i. p. 442.

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CHAPTER X.

OF EARTHQUAKES.

Having given the theory of volcanoes, we have, in some measure, given also that of earthquakes. They both seem to proceed from the same cause, only with this difference, that the fury of the volcano is spent in the eruption; that of an earthquake spreads wider, and acts more fatally by being confined. The volcano only affrights a province, earthquakes have laid whole kingdoms in ruin.

Philosophers[†] have taken some pains to distinguish between the various kinds of earthquakes, such as the tremulous, the pulsative, the perpendicular, and the inclined; but these are rather the distinctions of art than of nature, mere accidental differences arising from the situation of the country or of the cause. If, for instance, the confined fire acts directly under a province or a town, it will heave the earth perpendicularly upward, and produce a *perpendicular* earthquake. If it acts at a distance, it will raise that tract obliquely, and thus the inhabitants will perceive an *inclined* one.

Nor does it seem to me that there is much greater reason for Mr. Buffon's distinction of earthquakes. One kind of which he supposes[‡] to be produced by fire in the manner of volcanoes, and confined to but a very narrow circumference. The other kind he ascribes to the struggles of confined air, expanded by heat in the bowels of the earth, and endeavouring to get free. For how do these two causes differ?

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[*] Kircher, Mund. Subt. vol. i. p. 202. [†] Aristotle, Agricola, Buffon. [‡] Buffon, vol. ii. p. 328

Fire is an agent of no power whatsoever without air. It is the air, which being at first compressed, and then dilated in a cannon, that drives the ball with such force. It is the air struggling for vent in a volcano, that throws up its contents to such vast heights. In short, it is the air confined in the bowels of the earth, and acquiring elasticity by heat, that produces all those appearances which are generally ascribed to the operation of fire. When, therefore, we are told that there are two causes of earthquakes, we only learn that a greater or smaller quantity of heat produces those terrible effects; for air is the only active operator in either.

Some philosophers, however, have been willing to give the air as great a share in producing these terrible effects as they could; and, magnifying its powers, have called in but a very moderate degree of heat to put it in action. Although experience tells us that the earth is full of inflammable materials, and that fires are produced wherever we descend; although it tells us that those countries where there are volcanoes are most subject to earthquakes; yet they step out of their way, and so find a new solution. These only allow but just heat enough to produce the most dreadful phenomena, and backing their assertions with long calculations, give theory an air of demonstration Mr. Amontons* has been particularly sparing of the internal heat in this respect; and has shown, perhaps accurately enough, that a very moderate degree of heat may suffice to give the air amazing powers of expansion.

It is amusing enough, however, to trace the progress of a philosophical fancy let loose in imaginary speculations. They run thus: "A very moderate degree of heat may bring the air into a condition capable of producing earthquakes; for the air, at the depth of forty-three thousand five hundred and twenty-eight fathom below the surface of the earth, becomes almost as heavy as quicksilver. This, however, is but a very slight depth in comparison of the distance to the centre, and is scarce a seventieth part of the way. The air, therefore, at the centre, must be infinitely heavier than mercury, or any body that we know of. This granted, we shall take something more, and say, that it is very probable there is nothing but air at the centre. Now let us suppose this air heated, by some means, even to the degree of boiling water, as we have proved that the density of the air is here very great, its elasticity must be in proportion; a heat, therefore, which at the surface of the earth would have produced but a slight expansive force, must, at the centre, produce one very extraordinary, and, in short, be perfectly irresistible. Hence this force may, with great ease, produce earthquakes; and, if increased, it may convulse the globe; it may (by only adding figures enough to the calculation) destroy the solar system, and even the fixed stars themselves." These reveries generally produce nothing; for, as I have ever observed, increased calculations, while they seem to tire the memory, give the reasoning faculty perfect repose.

However, as earthquakes are the most formidable ministers of nature, it is not to be wondered that a multitude of writers have been curiously employed in their consideration. Woodward has ascribed the cause to a stoppage of the waters below the earth's surface by some accident. These being thus accumulated, and yet acted upon by fires, which he supposes still deeper, both contribute to heave up the earth upon their bosom. This, he thinks, accounts for the lakes of water produced in an earthquake, as well as for the fires that sometimes burst from the earth's surface upon those dreadful occasions. There are others still who have supposed that the earth may be itself the cause of its own convulsions. "When," say they, "the roots or basis of some large tract is worn away by a fluid underneath, the earth sinking therein, its weight occasions a tremor of the adjacent parts, sometimes producing a noise, and sometimes an inundation of water." Not to tire the reader with a history of opinions instead of facts, some have ascribed them to electricity, and some to the same causes that produce thunder.

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* Memoires de l'Academie des Sciences. An. 1703.

It would be tedious, therefore, to give all the various opinions that have employed the speculative upon this subject. The activity of the internal heat seems alone sufficient to account for every appearance that attends these tremendous irregularities of nature. To conceive this distinctly, let us suppose, at some vast distance under the earth, large quantities of inflammable matter, pyrites, bitumens, and marcasites, disposed, and only waiting for the aspersion of water, or the humidity of the air, to put their fires in motion: at last, this dreadful mixture arrives; waters find their way into those depths, through the perpendicular fissures; or air insinuates itself through the same minute apertures: instantly new appearances ensue; those substances, which for ages before lay dormant, now conceive new apparent qualities; they grow hot, produce new air, and only want room for expansion. However, the narrow apertures by which the air or water had at first admission, are now closed up; yet as new air is continually generated, and as the heat every moment gives this air new elasticity, it at length bursts, and dilates all round; and, in its struggles to get free, throws all above it into similar convulsions. Thus an earthquake is produced, more or less extensive, according to the depth or the greatness of the cause.

But before we proceed with the causes, let us take a short view of the appearances which have attended the most remarkable earthquakes. By these we shall see how far the theorist corresponds with the historian. The greatest we find in antiquity is that mentioned by Pliny,* in which twelve cities in Asia Minor were swallowed up in one night: he tells us also of another, near the lake Thrasymene, which was not perceived by the armies of the Carthaginians and Romans, that were then engaged near that lake, although it shook the greatest part of Italy. In another place† he gives the following account of an earthquake of an extraordinary kind. "When Lucius Marcus and Sextus Julius were consuls, there appeared a very strange prodigy of the earth, (as I have read in the books of Ætruscan discipline) which happened in the province of Mutina. Two mountains shocked against each other, approaching and retiring with the most dreadful noise. They, at the same time, and in the midst of the day, appeared to cast forth fire and smoke, while a vast number of Roman knights and travellers from the Æmilian Way, stood and continued amazed spectators. Several towns were destroyed by this shock; and all the animals that were near them were killed." In the time of Trajan, the city of Antioch, and a great part of the adjacent country, was buried by an earthquake. About three hundred years after, in the times of Justinian, it was once more destroyed, together with forty thousand inhabitants; and, after an interval of sixty years, the same ill-fated city was a third time overturned, with the loss of not less than sixty thousand souls. In the year 1182, most of the cities of Syria, and the kingdom of Jerusalem, were destroyed by the same accident. In the year 1594, the Italian historians describe an earthquake at Puteoli, which caused the sea to retire two hundred yards from its former bed.

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* Plin lib. ii. cap. 86. † Ibid. lib. iii. cap. 85.

But one of those most particularly described in history, is that of the year 1693; the damages of which were chiefly felt in Sicily, but its motion perceived in Germany, France, and England. It extended to a circumference of two thousand six hundred leagues; chiefly affecting the sea-coasts, and great rivers; more perceivable also upon the mountains than in the valleys. Its motions were so rapid, that those who lay at their length were tossed from side to side, as upon a rolling billow.* The walls were dashed from their foundations; and no less than fifty-four cities, with an incredible number of villages, were either destroyed or greatly damaged. The city of Catanea, in particular, was utterly overthrown. A traveller, who was on his way thither, at the distance of some miles, perceived a black cloud, like night, hanging over the place. The sea, all of a sudden, began to roar; Mount Ætna to send forth great spires of flame; and soon after a shock ensued, with a noise as if all the artillery in the world had been at once discharged. Our traveller, being obliged to alight, instantly felt himself raised a foot from the ground; and turning his eyes to the city, he, with amazement, saw nothing but a thick cloud of dust in the air. The birds flew about astonished; the sun was darkened; the beasts ran howling from the hills; and, although the shock did not continue above three minutes, yet near nineteen thousand of the inhabitants of Sicily perished in the ruins.—Catanea, to which city the describer was travelling, seemed the principal scene of ruin; its place only was to be found; and not a footstep of its former magnificence was to be seen remaining.

The earthquake which happened in Jamaica, in 1692, was very terrible, and its description sufficiently minute. "In two minutes' time it destroyed the town of Port-Royal, and sunk the houses in a gulf forty fathoms deep. It was attended with a hollow rumbling noise, like that of thunder; and, in less than a minute, three parts of the houses, and their inhabitants, were all sunk quite under water. While they were thus swallowed up on one side of the street, on the other the houses were thrown into heaps; the sand of the street rising like the waves of the sea, lifting up those that stood upon it, and immedi ately overwhelming them in pits. All the wells discharged their waters with the most vehement agitation. The sea felt an equal share of turbulence, and, bursting over its mounds, deluged all that came in its way. The fissures of the earth were, in some places, so great, that one of the streets appeared twice as broad as formerly. In many places, however, it opened and closed again, and continued this agitation for some time. Of these openings, two or three hundred might be seen at a time; in some whereof the people were swallowed up; in others, the earth closing, caught them by the middle, and thus crushed them instantly to death. Other openings, still more dreadful than the rest, swallowed up whole streets; and others, more formidable still, spouted up whole cataracts of water, drowning such as the earthquake had spared. The whole was attended with the most noisome stench; while the thundering of the distant falling mountains, the whole sky overcast with a dusky gloom, and the crash of falling habitations, gave unspeakable horror to the scene. After this dreadful calamity was over, the whole island seemed converted into a scene of desolation; scarce a planter's house was left standing; almost all were swallowed up; houses, people, trees, shared one universal ruin; and in their places appeared great pools of water, which, when dried up by the sun, left only a plain of barren sand, without any vestige of former inhabitants. Most of the rivers, during the earthquake, were stopt up by the falling in of the mountains; and it was not till after some time that they made themselves new channels. The mountains seemed particularly attacked by the force of the shock; and it was supposed that the principal seat of the concussion was among them. Those who were saved got on board ships in the harbour, where many remained above two months; the shocks continuing, during that interval, with more or less violence every day."

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* Phil. Trans.

As this description seems to exhibit all the appearances that usually make up the catalogue of terrors belonging to an earthquake, I will suppress the detail of that which happened at Lisbon, in our own times, and which is too recent to require a description. In fact, there are few particulars, in the accounts of those who were present at that scene of desolation, that we have not more minutely and accurately transmitted to us by former writers, whose narratives I have for that reason preferred. I will therefore close this description of human calamities, with the account of the dreadful earthquake at Calabria, in 1638. It is related by the celebrated Father Kircher, as it happened while he was on his journey to visit Mount Ætna, and the rest of the wonders that lie towards the south of Italy. I need scarce inform the reader, that Kircher is considered, by scholars, as one of the greatest prodigies of learning.

"Having hired a boat, in company with four more, two friars of the order of St. Francis, and two seculars, we launched, on the twenty-fourth of March, from the harbour of Messina, in Sicily, and arrived the same day at the promontory of Pelorus. Our destination was for the city of Euphæmia, in Calabria, where we had some business to transact, and where we designed to tarry for some time. However, Providence seemed willing to cross our design; for we were obliged to continue for three days at Pelorus, upon account of the weather;

and though we often put out to sea, yet we were as often driven back At length, however, wearied with the delay, we resolved to prosecute our voyage; and, although the sea seemed more than usually agitated, yet we ventured forward. The gulf of Charybdis, which we approached, seemed whirled round in such a manner, as to form a vast hollow, verging to a point in the centre. Proceeding onward, and turning my eyes to Ætna, I saw it cast forth large volumes of smoke, of mountainous sizes, which entirely covered the whole island, and blotted out the very shores from my view. This, together with the dreadful noise, and the sulphureous stench, which was strongly perceived, filled me with apprehensions that some more dreadful calamity was impending. The sea itself seemed to wear a very unusual appearance; those who have seen a lake in a violent shower of rain covered all over with bubbles, will conceive some idea of its agitations. My surprise was still increased by the calmness and serenity of the weather; not a breeze, not a cloud, which might be supposed to put all nature thus into motion. I therefore warned my companions that an earthquake was approaching; and, after some time, making for the shore with all possible diligence, we landed at Tropæa, happy and thankful for having escaped the threatening dangers of the sea.

"But our triumphs at land were of short duration; for we had scarce arrived at the Jesuits' College in that city, when our ears were stunned with a horrid sound, resembling that of an infinite number of chariots driven fiercely forward, the wheels rattling, and the thongs cracking. Soon after this, a most dreadful earthquake ensued, so that the whole tract upon which we stood seemed to vibrate, as if we were in the scale of a balance that continued wavering. This motion, however, soon grew more violent; and being no longer able to keep my legs, I was thrown prostrate upon the ground. In the mean time, the universal ruin round me redoubled my amazement. The crash of falling houses, the tottering of towers, and the groans of the dying, all contributed to raise my terror and despair. On every side of me I saw nothing but a scene of ruin, and danger threatening wherever I should fly. I commended myself to God, as my last great refuge. At that hour, O how vain was every sublunary happiness! wealth, honour, empire, wisdom, all mere useless sounds, and as empty as the bubbles in the deep. Just standing on the threshold of eternity, nothing but God was my pleasure; and the nearer I approached, I only loved him the more.—After some time, however, finding that I remained unhurt amidst the general concussion, I resolved to venture for safety, and running as fast as I could, reached the shore, but almost terrified out of my reason. I did not search long here till I found the boat in which I had landed, and my companions also, whose terrors were even greater than mine. Our meeting was not of that kind where every one is desirous of telling his own happy escape; it was all silence, and a gloomy dread of impending terrors.

"Leaving this seat of desolation, we prosecuted our voyage along the coast; and the next day came to Rochetta, where we landed, although the earth still continued in violent agitations. But we were scarce arrived at our inn, when we were once more obliged to return to the boat, and in about half an hour we saw the greatest part of the town, and the inn at which we had set up, dashed to the ground, and burying all its inhabitants beneath its ruins.

"In this manner, proceeding onward in our little vessel, finding no safety at land, and yet, from the smallness of our boat, having but a very dangerous continuance at sea, we at length landed at Lopizium, a castle midway between Tropæa and Euphæmia, the city to which, as I said before, we were bound. Here, wherever I turned my eyes, nothing but scenes of ruin and horror appeared; towns and castles levelled to the ground; Strombalo, though at sixty miles distance, belching forth flames in an unusual manner, and with a noise which I could distinctly hear. But my attention was quickly turned from more remote to contiguous danger. The rumbling sound of an approaching earthquake, which we by this time were grown acquainted with, alarmed us for the consequences; it every moment seemed to grow louder, and to approach more near. The place on which we stood now began to shake most dreadfully, so that being unable to stand, my companions and I caught hold of whatever shrub grew next us, and supported ourselves in that manner.

"After some time, this violent paroxysm ceasing, we again stood up, in order to prosecute our voyage to Euphæmia, that lay within sight. In the mean time, while we were preparing for this purpose. I turned my eyes towards the city, but could see only a frightful dark cloud that seemed to rest upon the place. This the more surprised us, as the weather was so very serene. We waited, therefore, till the cloud was past away; then turning to look for the city, it was totally sunk. Wonderful to tell! nothing but a dismal and putrid lake was seen where it stood. We looked about to find some one that could tell us of its sad catastrophe, but could see none! All was become a melancholy solitude! a scene of hideous desolation! Thus proceeding pensively along, in quest of some human being that could give us some little information, we at length saw a boy sitting by the shore, and appearing stupified with terror. Of him, therefore, we inquired concerning the fate of the city, but he could not be induced to give us an answer. We intreated him with every expression of tenderness and pity to tell us: but his senses were quite wrapt up in contemplation of the danger he had escaped. We offered him some victuals, but he seemed to loathe the sight. We still persisted in our offices of kindness; but he only pointed to the place of the city, like one out of his senses; and then running up into the woods, was never heard of after. Such was the fate of the city of Euphæmia! and as we continued our melancholy course along the shore, the whole coast, for the space of two hundred miles, presented nothing but the remains of cities, and men scattered, without a habitation, over the fields. Proceeding thus along, we at length ended our distressful voyage by arriving at Naples, after having escaped a thousand dangers both at sea and land."

The reader, I hope, will excuse me for this long translation from a favourite writer, and that the sooner, as it contains some particulars relative to earthquakes not to be found elsewhere. From the whole of these accounts we may gather, that the most concomitant circumstances are these:

A rumbling sound before the earthquake. This proceeds from the air or fire, or both, forcing their way through the chasms of the earth, and endeavouring to get free, which is also heard in volcanoes.

A violent agitation or heaving of the sea, sometimes before and sometimes after that at land. This agitation is only a similar effect produced on the waters with that at land, and may be called, for the sake of perspicuity, a *seaquake;* and this also is produced by volcanoes.

A spouting up of waters to great heights. It is not easy to describe the manner in which this is performed; but volcanoes also perform the same: Vesuvius being known frequently to eject a vast body of water.

A rocking of the earth to and fro, and sometimes a perpendicular bouncing, if it may be so called, of the same. This difference chiefly arises from the situation of the place with respect to the subterranean fire. Directly under, it lifts; at a farther distance, it rocks.

Some earthquakes seem to travel onward, and are felt in different countries at different hours the same day. This arises from the great shock being given to the earth at one place, and that, being communicated onward by an undulatory motion, successively affects different regions in its progress. As the blow given by a stone falling in a lake, is not perceived at the shores till some time after the first concussion.

The shock is sometimes instantaneous, like the explosion of gunpowder; and sometimes tremulous, and continuing for several minutes. The nearer the place where the shock is first given, the more instantaneous and simple it appears. At a greater distance, the earth redoubles the first blow with a sort of vibratory continuation.

As waters have generally so great a share in producing earthquakes, it is not to be wondered that they should generally follow those breaches made by the force of fire, and appear in the great chasms which the earthquake has opened.

These are some of the most remarkable phenomena of earthquakes, presenting a frightful assemblage of the most terrible effects of air, earth, fire, and water.

The valley of Solfatara, near Naples, seems to exhibit, in a minuter degree, whatever is seen of this horrible kind on the great theatre of nature. This plain, which is about twelve hundred feet long, and a thousand broad, is embosomed in mountains, and has in the middle of it a lake of noisome blackish water, covered with a bitumen, that floats upon its surface. In every part of this plain, caverns appear smoking with sulphur, and often emitting flames. The earth, wherever we walk over it, trembles beneath the feet. Noises of flames, and the hissing of waters, are heard at the bottom. The water sometimes spouts up eight or ten feet high. The most noisome fumes, fœtid water, and sulphureous vapours, offend the smell. A stone thrown into any of the caverns, is ejected again with considerable violence. These appearances generally prevail when the sea is any way disturbed; and the whole seems to exhibit the appearance of an earthquake in miniature. However, in this smaller scene of wonders, as well as in the greater, there are many appearances for which, perhaps we shall never account; and many questions may be asked, which no conjectures can thoroughly resolve. It was the fault of the philosophers of the last age, to be more inquisitive after the causes of things than after the things themselves. They seemed to think that a confession of ignorance cancelled their claims to wisdom; they, therefore, had a solution for every demand. But the present age has grown, if not more inquisitive, at least more modest; and none are now ashamed of that ignorance, which labour can neither remedy nor remove.

CHAPTER XI.

OF THE APPEARANCE OF NEW ISLANDS AND TRACTS; AND OF THE DISAPPEARANCE OF OTHERS.

HITHERTO we have taken a survey only of the evils which are produced by subterranean fires, but we have mentioned nothing of the benefits they may possibly produce. They may be of use in warming and cherishing the ground, in promoting vegetation, and giving a more exquisite flavour to the productions of the earth. The imagination of a person who has never been out of our own mild region, can scarcely reach to that luxuriant beauty with which all nature appears clothed in those very countries that we have just now described as desolated by earthquakes, and undermined by subterranean fires. It must be granted, therefore, that though in those regions they have a greater share in the dangers, they have also a larger proportion in the benefits of nature.

But there is another advantage arising from subterranean fires, which, though hitherto disregarded by man, yet may one day become serviceable to him; I mean, that while they are found to swallow up cities and plains in one place, they are also known to produce promontories and islands in another. We have many instances of islands being thus formed in the midst of the sea, which though for a long time barren, have afterwards become fruitful seats of happiness and industry.

New islands are formed in two ways; either suddenly, by the action of subterranean fires; or more slowly, by the deposition of mud, carried down by rivers, and stopped by some accident.* With respect particularly to the first, ancient historians, and modern travellers, give us such accounts as we can have no room to doubt of. Seneca assures us, that in his time the island of Therasia appeared unexpectedly to some mariners, as they were employed in another pursuit. Pliny assures us, that thirteen islands in the Mediterranean appeared at once emerging from the water; the cause of which he ascribes rather to the retiring of the sea in those parts, than to any subterraneous elevation. However, he mentions the island of Hiera, near that of Therasia. as formed by subterraneous explosions; and adds to his list several others formed in the same manner. In one of which he relates that fish in great abundance were found, and that all those who eat of them died shortly after.

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* Buffon. vol. ii. p. 343.

"On the twenty-fourth of May,[*] in the year 1707, a slight earthquake was perceived at Santorin; and the day following, at sun-rising, an object was seen by the inhabitants of that island, at two or three miles distance at sea, which appeared like a floating rock. Some persons, desirous either of gain, or incited by curiosity, went there, and found, even while they stood upon this rock, that it seemed to rise beneath their feet. They perceived also, that its surface was covered with pumice-stones and oysters, which it had raised from the bottom. Every day after, until the fourteenth of June, this rock seemed considerably to increase; and then was found to be half a mile round, and about thirty feet above the sea. The earth of which it was composed seemed whitish, with a small proportion of clay. Soon after this the sea again appeared troubled, and steams arose which were very offensive to the inhabitants of Santorin. But on the sixteenth of the succeeding month, seventeen or eighteen rocks more were seen to rise out of the sea, and at length to join together. All this was accompanied with the most terrible noise, and fires that proceeded from the island that was newly formed. The whole mass, however, of all this new formed earth, uniting, increased every day, both in height and breadth, and, by the force of its explosions, cast forth rocks to seven miles distance. This continued to bear the same dreadful appearances till the month of November in the same year; and it is at present a valcano which sometimes renews its explosions. It is about three miles in circumference; and more than from thirty-five to forty feet high."

It seems extraordinary, that about this place in particular, islands have appeared at different times, particularly that of Hiera, mentioned above, which has received considerable additions in succeeding ages. Justin tells us,[†] that at the time the Macedonians were at war with the Romans, a new island appeared between those of Theramenes and Therasia, by means of an earthquake. We are told that this became half as large again about a thousand years after, another island rising up by its side, and joining to it, so as scarce at present to be distinguished from the former.

A new island was formed, in the year 1720, near that of Tercera, near the continent of Africa, by the same causes. In the beginning of December, at night, there was a terrible earthquake at that place, and the top of a new island appeared, which cast forth smoke in vast quantities. The pilot of a ship, who approached it, sounded on one side of this island, and could not find ground at sixty fathom: at the other side the sea was totally tinged of a different colour, exhibiting a mixture of white, blue, and green; and was very shallow This island, on its first appearance, was larger than it is at present· for it has since that time sunk in such a manner, as to be scarcely above water.

A traveller, whom these appearances could not avoid affecting, speaks of them in this manner:[‡] "What can be more surprising than to see fire not only break out of the bowels of the earth, but also make itself a passage through the waters of the sea! What can be more extraordinary, or foreign to our common notions of things, than to see the bottom of the sea rise up into a mountain above the water, and become so firm an island as to be able to resist the violence of the greatest storms! I know that subterraneous fires, when pent in a narrow passage, are able to raise up a mass of earth as large as an island: but that this should be done in so regular and exact a manner that the water of the sea should not be able to penetrate and extinguish those fires; that after having made so many passages, they should retain force enough to raise the earth; and, in fine, after having been extinguished, that the mass of earth should not fall down, or sink again with its own weight, but still remain in a manner suspended over the great arch below! This is what to me seems more surprising than any thing that has been related of Mount Ætna, Vesuvius, or any other volcano."

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[*] Hist. del Acad an. 1708, p. 23. [†] Justin, lib. xxx. cap. 4 [‡] Phil. Trans. vol [illegible] p. 197.

Such are his sentiments; however, there are few of these appearances any way more extraordinary than those attending volcanoes and earthquakes in general. We are not more to be surprised that inflammable substances should be found beneath the bottom of the sea, than at similar depths at land. These have all the force of fire giving expansion to air, and tending to raise the earth at the bottom of the sea, till it at length heaves above water. These marine volcanoes are not so frequent; for, if we may judge of the usual procedure of nature, it must very often happen, that, before the bottom of the sea is elevated above the surface, a chasm is opened in it, and then the water pressing in, extinguishes the volcano before it has time to produce its effects. This extinction, however, is not effected without very great resistance from the fire beneath. The water, upon dashing into the cavern, is very probably at first ejected back with great violence; and thus some of those amazing water-spouts are seen, which have so often astonished the mariner, and excited curiosity. But of these in their place.

Besides the production of those islands by the action of fire, there are others, as was said, produced by rivers or seas carrying mud, earth, and such like substances, along with their currents; and at last depositing them in some particular place. At the mouths of most great rivers, there are to be seen banks, thus formed by the sand and mud carried down with the stream, which have rested at that place, where the force of the current is diminished by its junction with the sea. These banks, by slow degrees, increase at the bottom of the deep: the water in those places, is at first found by mariners to grow more shallow; the bank soon heaves up above the surface; it is considered, for a while, as a tract of useless and barren sand: but the seeds of some of the more hardy vegetables are driven thither by the wind, take root, and thus binding the sandy surface, the whole spot is clothed in time with a beautiful verdure. In this manner there are delightful and inhabited islands at the mouths of many rivers, particularly the Nile, the Po, the Mississippi, the Ganges, and the Senegal. There has been, in the memory of man, a beautiful and large island formed in this manner, at the mouth of the river Nanquin, in China made from depositions of mud at its opening: it is not less than sixty miles long, and about twenty broad. La Loubere informs us,* in his voyage to Siam, that these sand-banks increase every day, at the mouths of all the great rivers in Asia: and hence, he asserts, that the navigation up these rivers becomes every day more difficult, and will, at one time or other, be totally obstructed. The same may be remarked with regard to the Wolga, which has at present seventy openings into the Caspian sea; and of the Danube, which has seven into the Euxine. We have had an instance of the formation of a new island not very long since at the mouth of the Humber, in England. "It is yet within the memory of man," says the relator,† "since it began to raise its head above the ocean. It began its appearance at low water, for the space of a few hours, and was buried again till the next tide's retreat. Thus successively it lived and died, until the year 1666, when it began to maintain its ground against the insult of the waves, and first invited the aid of human industry. A bank was thrown about its rising grounds, and being thus defended from the incursions of the sea, it became firm and solid, and, in a short time, afforded good pasturage for cattle. It is about nine miles in circumference, and is worth to the proprietor about eight hundred pounds a year." It would be endless to mention all the islands that have been thus formed, and the advantages that have been derived from them. However, it is frequently found, that new islands may be often considered as only turning the rivers from their former beds; so that in proportion as land is gained at one part, it is lost by the overflowing of some other.

Little, therefore, is gained by such accessions; nor is there much more by the new islands which are sometimes formed from the spoils of the continent. Mariners assure us, that there are sometimes whole plains unrooted from the main lands, by floods and tempests. These being carried out to sea, with all the trees and animals upon them, are frequently seen floating in the ocean, and exhibiting a surprising appearance of rural tranquillity in the midst of danger. The greatest part, however, having the earth at their roots at length washed away, are dispersed, and their animals drowned; but now and then some are found to brave the fury of the ocean, till being struck either among rocks or sands, they again take firm footing, and become permanent islands.

As different causes have thus concurred to produce new islands, so we have accounts of others that the same causes have contributed to destroy. We have already seen the power of earthquakes exerted in sinking whole cities, and leaving lakes in their room. There have been islands, and regions also, that have shared the same fate; and have sunk with their inhabitants never more to be heard of. Thus Pausanias‡ tells us of an island, called Chryses, that was sunk near Lemnos. Pliny mentions several; among others, the island Cea, for thirty miles, having been washed away, with several thousands of its inhabitants. But of all the noted devastations of this kind, the total submersion of the island of Atalantis, as mentioned by Plato, has been most the subject of speculation. Mankind, in general, now consider the whole of his description as an ingenious fable; but when fables are grown famous by time and authority, they become an agreeable, if not a necessary part of literary information.

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* Lettres Curieuses et Edifiantes, sec. xi. p. 234.

† Phil. Trans. vol. iv. p. 251.

‡ Pausanias, l. 8. in Arcad. p. 509.

"About nine thousand years are passed," says Plato,[*] "since the island of Atalantis was in being. The priests of Egypt were well acquainted with it: and the first heroes of Athens gained much glory in their wars with the inhabitants. This island was as large as Asia Minor and Syria united; and was situated beyond the Pillars of Hercules, in the Atlantic ocean. The beauty of the buildings, and the fertility of the soil, were far beyond any thing a modern imagination can conceive; gold and ivory were every where common; and the fruits of the earth offered themselves without cultivation. The arts and courage of the inhabitants were not inferior to the happiness of their situation; and they were frequently known to make conquests, and overrun the continents of Europe and Asia." The imagination of the poetical philosopher riots in the description of the natural and acquired advantages, which they long enjoyed in this charming region. "If," says he, "we compare that country to our own, ours will appear a mere wasted skeleton, when opposed to it. The mountains to the very tops were clothed with fertility, and poured down rivers to enrich the plains below."

However, all these beauties and benefits were destroyed in one day by an earthquake sinking the earth, and the sea overwhelming it. At present not the smallest vestiges of such an island are to be found; Plato remains as the only authority for its existence: and philosophers dispute about its situation. It is not for me to enter into the controversy, when there appears but little probability to support the fact; and, indeed, it would be useless to run back nine thousand years in search of difficulties, as we are surrounded with objects that more closely affect us, and that demand admiration at our very doors. When I consider, as Lactantius suggests, the various vicissitudes of nature; lands swallowed by yawning earthquakes, or overwhelmed in the deep; rivers and lakes disappearing, or dried away; mountains levelled into plains; and plains swelling up into mountains; I cannot help regarding this earth as a place of very little stability; as a transient abode of still more transitory beings

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CHAPTER XII.

OF MOUNTAINS.

Having at last, in some measure, emerged from the deeps of the earth, we come to a scene of greater splendour; the contemplation of its external appearance. In this survey, its mountains are the first objects that strike the imagination, and excite our curiosity. There is not, perhaps, any thing in all nature that impresses an unaccustomed spectator with such ideas of awful solemnity, as these immense piles of Nature's erecting, that seem to mock the minuteness of human magnificence.

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[*] Plato in Critia.

In countries where there are nothing but plains, the smallest elevations are apt to excite wonder. In Holland, which is all a flat, they show a little ridge of hills, near the sea-side, which Boerhaave generally marked out to his pupils, as being mountains of no small consideration. What would be the sensations of such an auditory, could they at once be presented with a view of the heights and precipices of the Alps or the Andes! Even among us in England, we have no adequate ideas of a mountain-prospect; our hills are generally sloping from the plain, and clothed to the very top with verdure; we can scarce, therefore, lift our imaginations to those immense piles, whose tops peep up behind intervening clouds, sharp and precipitate, and reach to heights that human avarice or curiosity have never been able to ascend.

We, in this part of the world, are not, for that reason, so immediately interested in the question which has so long been agitated among philosophers, concerning what gave rise to these inequalities on the surface of the globe. In our own happy region, we generally see no inequalities but such as contribute to use and beauty; and we, therefore, are amazed at a question, inquiring how such necessary inequalities came to be formed, and seeming to express a wonder how the globe comes to be so beautiful as we find it. But though with us there may be no great cause for such a demand, yet in those places where mountains deform the face of nature, where they pour down cataracts, or give fury to tempests, there seems to be good reason for inquiry either into their causes or their uses. It has been, therefore, asked by many, in what manner mountains have come to be formed; or for what uses they are designed?

To satisfy curiosity in these respects, much reasoning has been employed, and very little knowledge propagated. With regard to the first part of the demand, the manner in which mountains were formed, we have already seen the conjectures of different philosophers on that head. One supposing that they were formed from the earth's broken shell at the time of the deluge; another, that they existed from the creation, and only acquired their deformities in process of time; a third, that they owed their original to earthquakes; and still a fourth, with much more plausibility than the rest, ascribing them entirely to the fluctuations of the deep, which he supposes in the beginning to have covered the whole earth. Such as are pleased with disquisitions of this kind, may consult Burnett, Whiston, Woodward, or Buffon. Nor would I be thought to decry any mental amusements, that at worst keep us innocently employed; but for my own part, I cannot help wondering how the opposite demand has never come to be made; and why philosophers have never asked how we come to have plains? Plains are sometimes more prejudicial to man than mountains. Upon plains, an inundation has greater power; the beams of the sun are often collected there with suffocating fierceness; they are sometimes found desert for several hundred miles together, as in the country east of the Caspian sea, although otherwise fruitful, merely because there are no risings nor depressions to form reservoirs, or collect the smallest rivulet of water. The most rational answer, therefore, why either mountains or plains were formed, seems to be that they were thus fashioned by the hand of Wisdom, in order that pain and pleasure should be so contiguous, as that mortality might be exercised either in bearing the one, or communicating the other.

Indeed, the more I consider this dispute respecting the formation of mountains, the more I am struck with the futility of the question. There is neither a straight line nor an exact superficies, in all nature. If we consider a circle, even with mathematical precision, we shall find it formed of a number of small right lines, joining at angles together. These angles, therefore, may be considered in a circle as mountains are upon our globe; and to demand the reason for the one being mountainous, or the other angular, is only to ask, why a circle is a circle, or a globe is a globe. In short, if there be no surface without inequality in nature, why should we be surprised that the earth has such? It has often been said, that the inequalities of its surface are scarce distinguishable, if compared to its magnitude; and I think we have every reason to be content with the answer.

Some, however, have avoided the difficulty by urging the final cause. They allege that mountains have been formed merely because they are useful to man. This carries the inquirer but a part of the way; for no one can affirm, that in all places they are useful. The contrary is known, by horrid experience, in those valleys that are subject to their influence. However, as the utility of any part of our earthly habitation is a very pleasing and flattering speculation to every philosopher, it is not to be wondered that much has been said to prove the usefulness of these. For this purpose, many conjectures have been made, that have received a degree of assent even beyond their evidence; for men were unwilling to become more miserably wise.

It has been alleged, as one principal advantage that we derive from them, that they serve like hoops or ribs, to strengthen our earth, and to bind it together. In consequence of this theory, Kircher has given us a map of the earth, in this manner hooped with its mountains; which might have a much more solid foundation, did it entirely correspond with truth.

Others have found a different use for them, especially when they run surrounding our globe; which is, that they stop the vapours which are continually travelling from the equator to the poles; for these being urged by the heat of the sun, from the warm regions of the line, must all be accumulated at the poles, if they were not stopped in their way by those high ridges of mountains which cross their direction. But an answer to this may be, that all the great mountains in America lie lengthwise, and therefore do not cross their direction.

But to leave these remote advantages, others assert, that not only the animal but vegetable part of the creation would perish for want of convenient humidity, were it not for their friendly assistance. Their summits are, by these, supposed to arrest, as it were, the vapours which float in the regions of the air. Their large inflections and channels are considered as so many basins prepared for the reception of those thick vapours, and impetuous rains, which descend into them. The huge caverns beneath are so many magazines or conservatories of water for the peculiar service of man; and those orifices by which the water is discharged upon the plain, are so situated as to enrich and render them fruitful, instead of returning through subterraneous channels to the sea, after the performance of a tedious and fruitless circulation.[*]

However this be, certain it is, that almost all our great rivers find their source among mountains; and, in general, the more extensive the mountain, the greater the river: thus the river Amazons, the greatest in the world, has its source among the Andes, which are the highest mountains on the globe; the river Niger travels a long course of several hundred miles from the Mountains of the Moon, the highest in all Africa; and the Danube and the Rhine proceed from the Alps, which are probably the highest mountains of Europe.

It need scarce be said, that, with respect to height, there are many sizes of mountains, from the gentle rising upland, to the tall craggy precipice. The appearance is in general different in those of different magnitudes. The first are clothed with verdure to the very tops, and only seem to ascend to improve our prospects, or supply us with a purer air: but the lofty mountains of the other class have a very different aspect. At a distance their tops are seen, in wavy ridges, of the very colour of the clouds, and only to be distinguished from them by their figure; which, as I have said, resemble the billows of the sea.[†] As we approach, the mountain assumes a deeper colour: it gathers upon the sky, and seems to hide half the horizon behind. Its summits also are become more distinct, and appear with a broken and perpendicular line. What at first seemed a single hill, is now found to be a chain of continued mountains, whose tops running along in ridges, are embosomed in each other; so that the curvatures of one are fitted to the prominences of the opposite side, and form a winding valley between, often of several miles in extent; and all the way continuing nearly of the same breadth.

Nothing can be finer, or more exact, than Mr. Pope's description of a traveller straining up the Alps. Every mountain he comes to he thinks will be the last; he finds, however, an unexpected hill rise before him; and that being scaled, he finds the highest summit almost at as great a distance as before. Upon quitting the plain, he might have left a green and fertile soil, and a climate warm and pleasing. As he ascends, the ground assumes a more russet colour; the grass becomes more mossy, and the weather more moderate. Still as he ascends, the weather becomes more cold, and the earth more barren. In this dreary passage he is often entertained with a little valley of surprising verdure, caused by the reflected heat of the sun collected into a narrow spot on the surrounding heights. But it much more frequently happens that he sees only frightful precipices beneath, and lakes of amazing depths, from whence rivers are formed, and fountains derive their original. On those places next the highest summits, vegetation is scarcely carried on; here and there a few plants of the most hardy kind appear. The air is intolerably cold; either continually refrigerated with frosts, or disturbed with tempests. All the ground here wears an eternal covering of ice, and snows that seem constantly accumulating. Upon emerging from this war of the elements, he ascends into a purer and serener region, where vegetation is entirely ceased; where the precipices, composed entirely of rocks, rise perpendicularly above him; while he views beneath him all the combat of the elements; clouds at his feet, and thunders darting upwards from their bosoms below.[*] A thousand meteors, which are never seen on the plain, present themselves. Circular rainbows;[†] mock suns; the shadow of the mountain projected upon the body of the air;[‡] and the traveller's own image, reflected as in a looking-glass, upon the opposite cloud.[§]

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[*] Nature Displayed, vol. iii. p. 83.

[†] Lettres Philosophiques sur la Formation, &c. p. 196

Such are, in general, the wonders that present themselves to a traveller in his journey either over the Alps or the Andes. But we must not suppose that this picture exhibits either a constant or an invariable likeness of those stupendous heights. Indeed, nothing can be more capricious or irregular than the forms of many of them. The tops of some run in ridges for a considerable length, without interruption; in others, the line seems indented by great valleys to an amazing depth. Sometimes a solitary and a single mountain rises from the bosom of the plain; and sometimes extensive plains, and even provinces, as those of Savoy and Quito, are found embosomed near the tops of mountains. In general, however, those countries that are most mountainous, are the most barren and uninhabitable.

If we compare the heights of mountains with each other, we shall find that the greatest and highest are found under the line.[||] It is thought by some, that the rapidity of the earth's motion in these parts, together with the greatness of the tides there, may have thrown up those stupendous masses of earth. But, be the cause as it may, it is a remarkable fact, that the inequalities of the earth's surface are greatest there. Near the poles, the earth, indeed, is craggy and uneven enough; but the heights of the mountains there, are very inconsiderable. On the contrary, at the equator, where nature seems to sport in the amazing size of all her productions, the plains are extensive, and the mountains remarkably lofty. Some of them are known to rise three miles perpendicular above the bed of the ocean.

To enumerate the most remarkable of these, according to their size, we shall begin with the Andes, of which we have an excellent description by Ulloa, who went thither by command of the king of Spain, in company with the French Academicians, to measure a degree of the meridian. His journey up these mountains is too curious not to give an extract from it.

After many incommodious days, sailing up the river Guayquil, he arrived at Caracol, a town situated at the foot of the Andes. Nothing could exceed the inconveniences which he experienced in his voyage, from the flies and moschitoes (an animal resembling our gnat.) "We were the whole day," says he, "in continual motion to keep them off; but at night our torments were excessive. Our gloves, indeed, were some defence to our hands; but our faces were entirely exposed; nor were our clothes a sufficient defence for the rest of our bodies; for their stings penetrating through the cloth, caused a very painful and fiery itching. One night, in coming to an anchor near a large and handsome house that was uninhabited, we had no sooner seated ourselves in it, than we were attacked on all sides by swarms of moschitoes, so that it was impossible to have one moment's quiet. Those who had covered themselves with clothes made for this purpose, found not the smallest defence; wherefore, hoping to find some relief in the open fields, they ventured out, though in danger of suffering in a more terrible manner from the serpents. But both places were equally obnoxious. On quitting this inhospitable retreat, we the next night took up our quarters in a house that was inhabited; the host of which being informed of the terrible manner we had past the night before, he gravely told us, that the house we so greatly complained of, had been forsaken on account of its being the purgatory of a soul. But we had more reason to believe that it was quitted on account of its being the purgatory of the body. After having journeyed for upwards of three days, through boggy roads, in which the mules at every step sunk up to their bellies, we began at length to perceive an alteration in the climate; and having been long accustomed to heat, we now began to feel it grow sensibly colder.

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[*] Ulloa, vol. i. [†] Ibid. [‡] Phil. Trans. vol. v. p. 152. [§] Ulloa, vol. i. [||] Buffon, passim

" It is remarkable, that at Tariguagua we often see instances of the effects of two opposite temperatures, in two persons happening to meet; one of them leaving the plains below, and the other descending from the mountain. The former thinks the cold so severe, that he wraps himself up in all the garments he can procure; while the latter finds the heat so great, that he is scarce able to bear any clothes whatsoever. The one thinks the water so cold, that he avoids being sprinkled by it; the other is so delighted with its warmth, that he uses it as a bath. Nor is the case very different in the same person, who experiences the same diversity of sensation upon his journey up, and upon his return. This difference only proceeds from the change naturally felt at leaving a climate to which one has been accustomed, and coming into another of an opposite temperature.

" The ruggedness of the road from Tariguagua, leading up the mountain, is not easily described. In some parts, the declivity is so great, that the mules can scarce keep their footing; and in others, the acclivity is equally difficult. The trouble of having people going before to mend the road, the pains arising from the many falls and bruises, and the being constantly wet to the skin, might be supported, were not these inconveniences augmented by the sight of such frightful precipices, and deep abysses, as must fill the mind with ceaseless terror. There are some places where the road is so steep, and yet so narrow, that the mules are obliged to slide down, without making any use of their feet whatsoever. On one side of the rider, in this situation, rises an eminence of several hundred yards; and on the other, an abyss of equal depth; so that if he in the least checks his mule, so as to destroy the equilibrium, they both must unavoidably perish.

" After having travelled about nine days in this manner, slowly winding along the side of the mountain, we began to find the whole country covered with a hoar frost: and a hut, in which we lay, had ice on it. Having escaped many perils, we at length, after a journey of fifteen days, arrived upon the plain, on the extremity of which stands the city of Quito, the capital of one of the most charming regions upon earth. Here, in the centre of the torrid zone, the heat is not only very tolerable, but in some places the cold also is painful. Here they enjoy all the temperature and advantages of perpetual spring; their fields being always covered with verdure, and enamelled with flowers of the most lively colours. However, although this beautiful region be higher than any other country in the world, and although it took up so many days of painful journey in the ascent, it is still overlooked by tremendous mountains; their sides covered with snow, and yet flaming with volcanoes at the top. These seemed piled one upon the other, and rise to a most astonishing height, with great coldness. However, at a determined point above the surface of the sea, the congelation is found at the same height in all the mountains. Those parts which are not subject to a continual frost, have here and there growing upon them a rush, resembling the genista, but much more soft and flexible. Towards the extremity of the part where the rush grows, and the cold begins to increase, is found a vegetable, with a round bulbous head, which, when dried, becomes of amazing elasticity. Higher up, the earth is entirely bare of vegetation, and seems covered with eternal snow. The most remarkable mountains are, that of Cotopaxi (already described as a volcano,) Chimborazo, and Pichincha. Cotopaxi is more than three geographical miles above the surface of the sea: the rest are not much inferior. On the top of the latter was my station for measuring a degree of the meridian; where I suffered particular hardships, from the intenseness of the cold, and the violence of the storms. The sky around was, in general, involved in thick fogs, which, when they cleared away, and the clouds, by their gravity, moved nearer to the surface of the earth, they appeared surrounding the foot of the mountain, at a vast distance below, like a sea, encompassing an island in the midst of it. When this happened, the horrid noises of tempests were heard from beneath, then discharging themselves on Quito, and the neighbouring country. I saw the lightnings issue from the clouds, and heard the thunders roll far beneath me. All this time, while the tempest was raging below, the mountain top, where I was placed, enjoyed a delightful serenity; the wind was abated; the sky clear; and the enlivening rays of the sun moderated the severity of the cold. However, this was of no very long duration, for the wind returned with all its violence, and with such velocity as to dazzle the sight; whilst my fears were increased by the dreadful concussions of the precipice, and the fall of enormous rocks; the only sounds that were heard in this frightful situation."

Such is the animated picture of these mountains, as given us by this ingenious Spaniard: and I believe the reader will wish that I had made the quotation still longer. A passage over the Alps, or a journey across the Pyrennees, appear petty trips or excursions in the comparison; and yet these are the most lofty mountains we know of in Europe.

If we compare the Alps with the mountains already described, we shall find them but little more than one half of the height of the former. The Andes, upon being measured by the barometer, are found above three thousand one hundred and thirty-six toises or fathoms above the surface of the sea.[*] Whereas the highest points of the Alps is not above sixteen hundred. The one, in other words, is above three miles high; the other about a mile and a half. The highest mountains in Asia are, Mount Taurus, Mount Immaus, Mount Caucasus, and the mountains of Japan. Of these, none equals the Andes in height: although Mount Caucasus, which is the highest of them, makes very near approaches. Father Verbiest tells of a mountain in China, which he measured, and found a mile and a half high.[†] In Africa, the Mountains of the Moon, famous for giving source to the Niger and the Nile, are rather more noted than known. Of the Peak of Teneriffe, one of the Canary Islands that lie off this coast, we have more certain information. In the year 1727, it was visited by a company of English merchants, who travelled up to the top, where they observed its height, and the volcano on its very summit.[‡] They found it a heap of mountains, the highest of which rises over the rest like a sugar-loaf, and gives a name to the whole mass. It is computed to be a mile and a half perpendicular from the surface of the sea. Kircher gives us an estimate of the heights of most of the other great mountains in the world; but as he has taken his calculations in general from the ancients, or from modern travellers, who had not the art of measuring them, they are quite incredible. The art of taking the heights of places by the barometer, is a new and an ingenious invention. As the air grows lighter as we ascend, the fluid in the tube rises in due proportion: thus the instrument being properly marked, gives the height with a tolerable degree of exactness; at least enough to satisfy curiosity.

Few of our great mountains have been estimated in this manner; travellers having, perhaps, been deterred, by a supposed impossibility of breathing at the top. However, it has been invariably found, that the air in the highest that our modern travellers have ascended, is not at all too fine for respiration. At the top of the Peak of Teneriffe, there was found no other inconvenience from the air, except its coldness; at the top of the Andes, there was no difficulty of breathing perceived. The accounts, therefore, of those who have asserted that they were unable to breathe, although at much less heights, are greatly to be suspected. In fact, it is very natural for mankind to paint those obstacles as insurmountable, which they themselves have not had the fortitude or perseverance to surmount.

The difficulty and danger of ascending to the tops of mountains, proceeds from other causes, not the thinness of the air. For instance, some of the summits of the Alps have never yet been visited by man. But the reason is, that they rise with such a rugged and precipitate ascent, that they are utterly inaccessible. In some places they appear like a great wall of six or seven hundred feet high; in others, there stick out enormous rocks, that hang upon the brow of the steep, and every moment threaten destruction to the traveller below.

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[*] Ulloa, vol. [illegible] p. 442. [†] Verbiest, alla Chine. [‡] Phil. Trans. vol. v.

In this manner almost all the tops of the highest mountains are bare and pointed. And this naturally proceeds from their being so continually assaulted by thunder and tempests. All the earthy substances with which they might have been once covered, have for ages been washed away from their summits; and nothing is left remaining but immense rocks, which no tempest has hitherto been able to destroy.

Nevertheless, time is every day, and every hour, making depredations; and huge fragments are seen tumbling down the precipice, either loosened from the summit by frost or rains, or struck down by lightning. Nothing can exhibit a more terrible picture than one of these enormous rocks, commonly larger than a house, falling from its height, with a noise louder than thunder, and rolling down the side of the mountain. Doctor Plot tells us of one in particular, which being loosened from its bed, tumbled down the precipice, and was partly shattered into a thousand pieces. Notwithstanding, one of the largest fragments of the same, still preserving its motion, travelled over the plain below, crossed a rivulet in the midst, and at last stopped on the other side of the bank! These fragments, as was said, are often struck off by lightning, and sometimes undermined by rains; but the most usual manner in which they are disunited from the mountain, is by frost: the rains insinuating between the interstices of the mountain, continue there until there comes a frost, and then, when converted into ice, the water swells with an irresistible force, and produces the same effect as gunpowder, splitting the most solid rocks, and thus shattering the summits of the mountain.

But not rocks alone, but whole mountains are, by various causes, disunited from each other. We see in many parts of the Alps, amazing clefts, the sides of which so exactly correspond with the opposite, that no doubt can be made of their having been once joined together. At Cajeta,* in Italy, a mountain was split in this manner by an earthquake; and there is a passage opened through it, that appears as if elaborately done by the industry of man. In the Andes these breaches are frequently seen. That at Thermopylæ, in Greece, has been long famous. The mountain of the Troglodytes, in Arabia, has thus a passage through it: and that in Savoy, which Nature began, and which Victor Amadeus completed, is an instance of the same kind.

We have accounts of some of these disruptions, immediately after their happening. "In the month of June,† in the year 1714, a part of the mountain of Diableret, in the district of Valais, in France, suddenly fell down, between two and three o'clock in the afternoon, the weather being very calm and serene. It was of a conical figure, and destroyed fifty-five cottages in the fall. Fifteen persons, together with about a hundred beasts, were also crushed beneath its ruins, which covered an extent of a good league square. The dust it occasioned instantly covered all the neighbourhood in darkness. The heaps of rubbish were more than three hundred feet high. They stopped the current of a river that ran along the plain, which now is formed into several new and deep lakes. There appeared through the whole of this rubbish, none of those substances that seemed to indicate that this disruption had been made by means of subterraneous fires. Most probably, the base of this rocky mountain was rotted and decayed; and thus fell, without any extraneous violence." In the same manner, in the year 1618, the town of Pleurs, in France, was buried beneath a rocky mountain, at the foot of which it was situated.

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* Buffon, vol. ii. p. 364.

† Hist. de l'Academie des Sciences, p. 1. an. 1715

These accidents, and many more that might be enumerated of the same kind, have been produced by various causes: by earthquakes, as in the mountain at Cajeta; or by being decayed at the bottom, as at Diableret. But the most general way is, by the foundation of one part of the mountain being hollowed by waters, and thus wanting a support, breaking from the other. Thus it generally has been found in the great chasms in the Alps; and thus it almost always is known in those disruptions of hills, which are known by the name of land-slips. These are nothing more than the slidings down of a higher piece of ground, disrooted from its situation by subterraneous inundations, and settling itself upon the plain below.

There is not an appearance in all nature that so much astonished our ancestors, as these land-slips. In fact, to behold a large upland, with its houses, its corn, and cattle, at once loosened from its place, and floating, as it were, upon the subjacent water; to behold it quitting its ancient situation, and travelling forward like a ship in quest of new adventures; this is certainly one of the most extraordinary appearances that can be imagined; and to a people, ignorant of the powers of nature, might well be considered as a prodigy. Accordingly, we find all our old historians mentioning it as an omen of approaching calamities. In this more enlightened age, however, its cause is very well known; and, instead of exciting ominous apprehensions in the populace, it only gives rise to some very ridiculous law-suits among them, about whose the property shall be; whether the land which has thus slipt, shall belong to the original possessor, or to him upon whose grounds it has encroached and settled. What has been the determination of the judges, is not so well known, but the circumstances of the slips have been minutely and exactly described.

In the lands of Slatberg,* in the kingdom of Iceland, there stood a declivity, gradually ascending for near half a mile. In the year 1713, and on the 10th of March, the inhabitants perceived a crack on its side, somewhat like a furrow made with a plough, which they imputed to the effects of lightning, as there had been thunder the night before. However, on the evening of the same day, they were surprised to hear a hideous confused noise issuing all round from the side of the hill; and their curiosity being raised, they resorted to the place. There, to their amazement, they found the earth, for near five acres, all in gentle motion, and sliding down the hill upon the subjacent plain. This motion continued the remaining part of the day, and the whole night; nor did the noise cease during the whole time; proceeding, probably, from the attrition of the ground beneath. The day following, however, this strange journey down the hill ceased entirely; and above an acre of the meadow below was found covered with what before composed a part of the declivity.

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* Phil. Trans. vol. iv. p. 250.

However, these slips, when a whole mountain's side seems to descend, happen but very rarely. There are some of another kind, however, much more common; and, as they are always sudden, much more dangerous. These are snow-slips, well known, and greatly dreaded by travellers. It often happens, that when snow has long been accumulated on the tops and on the sides of mountains, it is borne down the precipice, either by means of tempests, or its own melting. At first, when loosened, the volume in motion is but small; but gathers as it continues to roll; and, by the time it has reached the habitable parts of the mountain, is generally grown of enormous bulk Wherever it rolls, it levels all things in its way; or buries them in unavoidable destruction. Instead of rolling, it sometimes is found to slide along from the top; yet even thus it is generally as fatal as before. Nevertheless, we have had an instance, a few years ago, of a small family in Germany, that lived for above a fortnight beneath one of these snow-slips. Although they were buried during that whole time, in utter darkness, and under a bed of some hundred feet deep, yet they were luckily taken out alive; the weight of the snow being supported by a beam that kept up the roof; and nourishment being supplied them by the milk of an ass, if I remember right, that was buried under the same ruin.

But it is not the parts alone that are thus found to subside, whole mountains have been known totally to disappear. Pliny tells us,* that in his own time, the lofty mountain of Cybotus, together with the city of Eurites, were swallowed by an earthquake. The same fate, he says, attended Phlegium, one of the highest mountains in Ethiopia; which, after one night's concussion, was never seen more. In more modern times, a very noted mountain in the Molucca islands, known by the name of the *Peak*, and remarkable for being seen at a very great distance from sea, was swallowed by an earthquake; and nothing but a lake was left in the place where it stood. Thus, while storms and tempests are levelled against mountains above, earthquakes and waters are undermining them below. All our histories talk of their destruction; and a very few new ones (if we except Mount Cenere, and one or two such heaps of cinders) are produced. If mountains, therefore, were of such great utility as some philosophers make them to mankind, it would be a very melancholy consideration that such benefits were diminishing every day. But the truth is, the valleys are fertilized by that earth which is washed from their sides; and the plains become richer, in proportion as the mountains decay.

CHAPTER XIII.

OF WATER.

In contemplating nature, we shall often find the same substances possessed of contrary qualities, and producing opposite effects. Air, which liquifies one substance, dries up another. That fire which is seen to burn up the desert, is often found, in other places, to assist the luxuriance of vegetation; and water, which, next to fire, is the most fluid substance upon earth, nevertheless, gives all other bodies their firmness and durability; so that every element seems to be a powerful servant, capable either of good or ill, and only awaiting external direction, to become the friend or the enemy of mankind. These opposite qualities, in this substance in particular, have not failed to excite the admiration and inquiry of the curious.

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* Plin. l. ii. cap. 93.

That water is the most fluid penetrating body, next to fire, and the most difficult to confine, is incontestibly proved by a variety of experiments. A vessel through which water cannot pass, may be said to retain any thing. It may be objected indeed, that syrups, oils, and honey, leak through some vessels that water cannot pass through; but this is far from being the result of the greater tenuity and fineness of their parts; it is owing to the rosin wherewith the wood of such vessels abounds, which oils and syrups have a power of dissolving; so that these fluids, instead of finding their way, may more properly be said to eat their way through the vessels that contain them. However, water will at last find its way even through these; for it is known to escape through vessels of every substance, glass only excepted. Other bodies may be found to make their way out more readily indeed; as air, when it finds a vent, will escape at once; and quicksilver, because of its weight, quickly penetrates through whatever chinky vessel confines it: but water, though it operates more slowly, yet always finds a more certain issue. As, for instance, it is well known that air will not pass through leather; which water will very readily penetrate. Air also may be retained in a bladder; but water will quickly ooze through. And those who drive this to the greatest degree of precision, pretend to say, that it will pass through pores ten times smaller than air can do. Be this as it may, we are very certain that its parts are so small that they have been actually driven through the pores of gold. This has been proved by the famous Florentine experiment, in which a quantity of water was shut up in a hollow ball of gold, and then pressed with a huge force by screws, during which the fluid was seen to ooze out through the pores of the metal, and to stand, like a dew, upon its surface.

As water is thus penetrating, and its parts thus minute, it may easily be supposed that they enter into the composition of all bodies, vegetable, animal, and fossil. This every chymist's experience convinces him of; and the mixture is the more obvious, as it can always be separated, by a gentle heat, from those substances with which it had been united. Fire, as was said, will penetrate where water cannot pass; but then it is not so easily to be separated. But there is scarce any substance from which its water cannot be divorced. The parings or filings of lead, tin, and antimony, by distillation, yield water plentifully: the hardest stones, sea-salt, nitre, vitriol, and sulphur, are found to consist chiefly of water; into which they resolve by force of fire. "All birds, beasts, and fishes," says Newton, "insects, trees, and vegetables, with their parts, grow from water; and, by putrefaction, return to water again." In short, almost every substance that we see, owes its texture and firmness to the parts of wa ter that mix with its earth; and, deprived of this fluid, it becomes a mass of shapeless dust and ashes.

From hence we see, as was above hinted, that this most fluid body, when mixed with others, gives them consistence and form. Water, by being mixed with earth and ashes, and formed into a vessel, when baked before the fire, becomes a coppel, remarkable for this, that it will bear the utmost force of the hottest furnace that art can contrive. So the Chinese earth, of which porcelain is made, is nothing more than an artificial composition of earth and water, united by heat; and which a greater degree of heat could easily separate. Thus we see a body, extremely fluid of itself, in some measure assuming a new nature, by being united with others: we see a body, whose fluid and dissolving qualities are so obvious, giving consistence and hardness to all the substances of the earth.

From considerations of this kind, Thales, and many of the ancient philosophers, held that all things were made of water. In order to confirm this opinion, Helmont made an experiment, by divesting a quantity of earth of all its oils and salts, and then putting this earth, so prepared, into an earthen pot, which nothing but rain-water could enter, and planting a willow therein; this vegetable, so planted, grew up to a considerable height and bulk, merely from the accidental aspersion of rain-water; while the earth, in which it was planted, received no sensible diminution. From this experiment, he concluded, that water was the only nourishment of the vegetable tribe; and that vegetables, being the nourishment of animals, all organized substances, therefore, owed their support and being only to water. But this has been said by Woodward to be all a mistake: for he shows, that water being impregnated with earthy particles, is only the conveyer of such substances into the pores of vegetables, rather than an increaser of them, by its own bulk: he shows that water is ever found to afford much less nourishment, in proportion as it is purified by distillation. A plant in distilled water, will not grow so fast as in water not distilled: and if the same be distilled three or four times over, the plant will scarce grow at all, or receive any nourishment from it. So that water, as such, does not seem the proper nourishment of vegetables, but only the vehicle thereof, which contains the nutritious particles, and carries them through all parts of the plant. Water, in its pure state, may suffice to extend or swell the parts of a plant, but affords vegetable matter in a moderate proportion.

However this be, it is agreed on all sides, that water, such as we find it, is far from being a pure simple substance. The most genuine we know is mixed with exhalations and dissolutions of various kinds; and no expedient that has been hitherto discovered, is capable of purifying it entirely. If we filter and distil it a thousand times, according to Boerhaave, it will still depose a sediment: and by repeating the process we may evaporate it entirely away, but can never totally remove its impurities. Some, however, assert, that water, properly distilled, will have no sediment;* and that the little white speck which is found at the bottom of the still, is a substance that enters from without. Kircher used to show in his museum, a phial of water, that had been kept for fifty years, hermetically sealed;[*] during which it had deposed no sediment, but continued as transparent as when first it was put in. How far, therefore, it may be brought to a state of purity by distillation, is unknown; but we very well know, that all such water as we every where see, is a bed in which plants, minerals, and animals, are all found confusedly floating together.

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* Hill's History of Fossils.

Rain-water, which is a fluid of Nature's own distilling, and which has been raised so high by evaporation, is, nevertheless, a very mixed and impure substance. Exhalations of all kinds, whether salts, sulphurs, or metals, make a part of its substance, and tend to increase its weight. If we gather the water that falls, after a thunder-clap, in a sultry summer's day, and let it settle, we shall find a real salt sticking at the bottom. In winter, however, its impure mixtures are fewer, but still may be separated by distillation. But as to that which is generally caught pouring from the tops of houses, it is particularly foul, being impregnated with the smoke of the chimnies, the vapour of the slate or tiles, and with other impurities that birds and animals may have deposited there. Besides, though it should be supposed free from all these, it is mixed with a quantity of air, which, after being kept for some time, will be seen to separate.

Spring-water is next in point of purity. This, according to Dr. Halley, is collected from the air itself; which being sated with water, and coming to be condensed by the evening's cold, is driven against the tops of the mountains, where being condensed, and collected, it trickles down by the sides, into the cavities of the earth; and running for a while underground, bubbles up in fountains upon the plain. This having made but a short circulation, has generally had no long time to dissolve or imbibe any foreign substances by the way.

River-water is generally more foul than the former.—Wherever the stream flows, it receives a tincture from its channel. Plants, minerals, and animals, all contribute to add to its impurities: so that such as live at the mouths of great rivers, generally are subject to all those disorders which contaminated and unwholesome waters are known to produce. Of all the river-water in the world, that of the Indus and the Thames is said to be the most light and wholesome.

The most impure fresh-water that we know, is that of stagnated pools and lakes, which, in summer, may be more properly considered as a jelly of floating insects, than a collection of water. In this, millions of little reptiles, undisturbed by any current, which might crush their frames to pieces, breed and engender. The whole teems with shapeless life, and only grows more fruitful by increasing putrefaction.

Of the purity of all these waters, the lightness, and not the transparency, ought to be the test. Water may be extremely clear and beautiful to the eye, and yet very much impregnated with mineral particles. In fact, sea-water is the most transparent of any, and yet it is well known to contain a large mixture of salt and bitumen. On the contrary, those waters which are lightest, have the fewest dissolutions floating in them; and may, therefore, be the most useful for all the purposes of life. But, after all, though much has been said upon this subject, and although waters have been weighed with great assiduity, to determine their degree of salubrity, yet neither this, nor their curdling with soap, nor any other philosophical standard whatsoever, will answer the purposes of true information. Experience alone ought to determine the useful or noxious qualities of every spring; and experience assures us, that different kinds of water are adapted to different constitutions. An incontestible proof of this, are the many medicinal springs throughout the world, whose peculiar benefits are known to the natives of their respective countries. These are of various kinds, according to the different minerals with which they are impregnated; hot, saline, sulphureous, bituminous, and oily. But the account of these will come most properly under that of the several minerals by which they are produced.

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[*] Hermetically sealing a glass vessel, means no more than heating the mouth of the phial red hot; and thus when the glass is become pliant, squeezing the mouth together with a pair of pincers, and then twisting it six or seven times round, which effectually closes it up.

After all, therefore, we must be contented with but an impure mixture for our daily beverage. And yet, perhaps, this very mixture may often be more serviceable to our health than that of a purer kind. We know that it is so with regard to vegetables: and why not, also, in general, to man? Be this as it will, if we are desirous of having water in its greatest purity, we are ordered, by the curious in this particular, to distil it from snow, gathered upon the tops of the highest mountains, and to take none but the outer and superficial part thereof. This we must be satisfied to call pure water; but even this is far short of the pure unmixed philosophical element; which, in reality, is no where to be found.

As water is thus mixed with foreign matter, and often the repository of minute animals, or vegetable seeds, we need not be surprised that, when carried to sea, it is always found to putrefy. But we must not suppose that it is the element itself which thus grows putrid and offensive, but the substances with which it is impregnated. It is true, the utmost precautions are taken to destroy all vegetable and animal substances that may have previously been lodged in it, by boiling; but, notwithstanding this, there are some that will still survive the operation, and others that find their way during the time of its stowage. Seamen, therefore, assure us, that their water is generally found to putrefy twice, at least, and sometimes three times in a long voyage. In about a month after it has been at sea, when the bung is taken out of the cask, it sends up a noisome and dangerous vapour, which would take fire upon the application of a candle.* The whole body of the water then is found replete with little worm-like insects, that float, with great briskness, through all its parts. These generally live for about a couple of days; and then dying, by depositing their spoils, for a while increase the putrefaction. After a time, the heavier parts of these sinking to the bottom, the lighter float, in a scum, at the top; and this is what mariners call, the water's purging itself. There is still, however, another race of insects, which are bred, very probably, from the spoils of the former; and produce, after some time, similar appearances; these dying, the water is then thought to change no more. However, it very often happens, especially in hot climates, that nothing can drive these nauseous insects from the ship's store of water. They often increase to a very disagreeable and frightful size, so as to deter the mariner, though parching with thirst, from tasting that cup which they have contaminated.

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* Phil. Trans. vol. v. part ii. p. 71.

This water, as thus described, therefore, is a very different fluid from that simple elementary substance upon which philosophical theories have been founded; and concerning the nature of which there have been so many disputes. Elementary water is no way compounded; but is without taste, smell, or colour; and incapable of being discerned by any of the senses, except the touch. This is the famous dissolvent of the chymists, into which, as they have boasted, they can reduce all bodies; and which makes up all other substances, only by putting on a different disguise. In some forms, it is fluid, transparent, and evasive of the touch; in others, hard, firm, and elastic. In some, it is stiffened by cold; in others, dissolved by fire. According to them, it only assumes external shapes from accidental causes; but the mountain is as much a body of water, as the cake of ice that melts on its brow; and even the philosopher himself is composed of the same materials with the cloud or meteor which he contemplates.

Speculation seldom rests where it begins. Others disallowing the universality of this substance, will not allow that in a state of nature there is any such thing as water at all. "What assumes the appearance," say they, "is nothing more than melted ice. Ice is the real element of Nature's making; and when found in a state of fluidity, it is then in a state of violence. All substances are naturally hard; but some more readily melt with heat than others. It requires a great heat to melt iron; a smaller heat will melt copper: silver, gold, tin, and lead, melt with smaller still: ice, which is a body like the rest, melts with a very moderate warmth; and quicksilver melts with the smallest warmth of all. Water, therefore, is but ice kept in continual fusion; and still returning to its former state, when the heat is taken away." Between these opposite opinions, the controversy has been carried on with great ardour, and much has been written on both sides; and yet, when we come to examine the debate, it will probably terminate in this question, whether cold or heat first began their operations upon water? This is a fact of very little importance, if known; and, what is more, it is a fact we can never know.

Indeed, if we examine into the operations of cold and heat upon water, we shall find that they produce somewhat similar effects. Water dilates in its bulk, by heat, to a very considerable degree; and, what is more extraordinary, it is likewise dilated by cold, in the same manner.

If water be placed over a fire, it grows gradually larger in bulk, as it becomes hot, until it begins to boil; after which no art can either increase its bulk or its heat. By increasing the fire, indeed, it may be more quickly evaporated away; but its heat and its bulk still continue the same. By the expanding of this fluid, by heat, philosophers have found a way to determine the warmth or the coldness of other bodies: for if put into a glass tube, by its swelling and rising it shows the quantity of heat in the body to which it is applied; by its contracting and sinking, it shows the absence of the same. Instead of using water in this instrument, which is called a thermometer, they now make use of spirit of wine, which is not apt to freeze, and which is endued even with a greater expansion by heat than water. The instrument consists of nothing more than a hollow ball of glass, with a long tube growing out of it. This being partly filled with spirits of wine tinctured red, so as to be seen when it rises, the ball is plunged into boiling water, which making the spirit within expand and rise in the tube, the water marks the greatest height to which it ascends; at this point the tube is to be broken off, and then hermetically sealed, by melting the glass with a blow-pipe: a scale being placed by the side, completes the thermometer. Now as the fluid expands or condenses with heat or cold, it will rise and fall in the tube in proportion; and the degree or quantity of ascent or descent will be seen in the scale.

No fire, as was said, can make water hotter, after it begins to boil. We can, therefore, at any time be sure of an equable certain heat; which is that of boiling water, which is invariably the same. The certainty of such a heat is not less useful than the instrument that measures it. It affords a standard, fixed, degree of heat over the whole world; boiling water being as hot in Greenland, as upon the coasts of Guinea. One fire is more intense than another; of heat there are various degrees; but boiling water is a heat every where the same, and easily procurable.

As heat thus expands water, so cold, when it is violent enough to freeze the same, produces exactly the same effect, and expands it likewise. Thus water is acted upon in the same manner by two opposite qualities; being dilated by both. As a proof that it is dilated by cold, we have only to observe the ice floating on the surface of a pond, which it would not do were it not dilated, and grown more bulky, by freezing, than the water, which remains unfroze. Mr. Boyle, however, put the matter past a doubt, by a variety of experiments.* Having poured a proper quantity of water into a strong earthen vessel, he exposed it, uncovered, to the open air, in frosty nights; and observed, that continually the ice reached higher than the water, before it was frozen. He filled also a tube with water, and stopped both ends with wax: the water, when frozen, was found to push out the stopples from both ends; and a rod of ice appeared at each end of the tube, which showed how much it was swollen by the cold within.

From hence, therefore, we may be very certain of the cold's dilating of the water; and experience also shows, that the force of this expansion has been found as great as any which heat has been found to produce. The touch-hole of a strong gun-barrel being stopped, and a plug of iron forcibly driven into the muzzle, after the barrel had been filled with water, it was placed in a mixture of ice and salt; the plug, though soldered to the barrel, at first gave way, but being fixed in more firmly, within a quarter of an hour the gun-barrel burst with a loud noise, and blew up the cover of the box wherein it lay Such is its force in an ordinary experiment. But it has been known to burst cannons, filled with water, and then left to freeze; for the cold congealing the water, and the ice swelling, it became irresistible. The bursting of rocks, by frost, which is frequent in the northern climates, and is sometimes seen in our own, is an equal proof of the expansion of congealed water. For having by some means insinuated itself into the body of the rock, it has remained there till the cold was sufficient to affect it by congelation. But when once frozen, no obstacle is able to confine it from dilating; and, if it cannot otherwise find room, the rock must burst asunder.

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* Boyle, vol. I. p. 610.

This alteration in the bulk of water might have served as a proof that it was capable of being compressed into a narrower space than it occupied before; but, till of late, water was held to be incompressible. The general opinion was, that no art whatsoever could squeeze it into a narrower compass; that no power on earth, for instance, could force a pint of water into a vessel that held a hair's-breadth less than a pint. And this, said they, appears from the famous Florentine experiment; where the water, rather than suffer compressure, was seen to ooze through the pores of the solid metal; and, at length, making a cleft in the side, spun out with great vehemence. But later trials have proved that water is very compressible, and partakes of that elasticity which every other body possesses in some degree. Indeed, had not mankind been dazzled by the brilliancy of one inconclusive experiment, there were numerous reasons to convince them of its having the same properties with other substances. Ice, which is water in another state, is very elastic. A stone, flung slantingly along the surface of a pond, bounds from the water several times; which shows it to be elastic also. But the trials of Mr. Canton have put this past all doubt; which being somewhat similar to those of the great Boyle, who pressed it with weights properly applied, carry sufficient conviction.

What has been hitherto related, is chiefly applicable to the element of water alone; but its fluidity is a property that it possesses in common with several other substances, in other respects greatly differing from it. That quality which gives rise to the definition of a fluid, namely, that its parts are in a continual intestine motion, seems extremely applicable to water. What the shapes of those parts are, it would be vain to attempt to discover. Every trial only shows the futility of the attempt; all we find is, that they are extremely minute; and that they roll over each other with the greatest ease. Some, indeed, from this property alone, have not hesitated to pronounce them globular; and we have, in all our hydrostatical books, pictures of these little globes in a state of sliding and rolling over each other. But all this is merely the work of imagination; we know that substances of any kind, reduced very small, assume a fluid appearance, somewhat resembling that of water. Mr. Boyle, after finely powdering and sifting a little dry powder of Plaster of Paris, put it in a vessel over the fire, where it soon began to boil like water, exhibiting all the motions and appearances of a boiling liquor. Although but a powder, the parts of which we know are very different from each other, and just as accident has formed them, yet it heaved in great waves like water. Upon agitation, a heavy body will sink to the bottom, and a light one emerge to the top. There is no reason, then, to suppose the figure of the parts of water round, since we see their fluidity very well imitated by a composition, the parts of which are of various forms and sizes. The shape of the parts of water, therefore, we must be content to continue ignorant of. All we know is, that earth, air, and fire, conduce to separate the parts from each other.

Earthy substances divide the parts from each other, and keep them asunder. This division may be so great, that the water will entirely lose its fluidity thereby. Mud, potter's clay, and dried bricks, are but so many different combinations of earth and water, each substance in which the parts of water are most separated from each other, appearing to be the most dry. In some substances, indeed, where the parts of water are greatly divided, as in porcelain, for instance, it is no easy matter to recover and bring them together again; but they continue in a manner fixed and united to the manufactured clay. This circumstance led Doctor Cheney into a very peculiar strain of thinking. He suspected that the quantity of water, on the surface of the earth, was daily decreasing. For, says he, some parts of it are continually joined to vegetable, animal, and mineral substances, which no art can again recover. United with these, the water loses its fluidity; for if, continues he, we separate a few particles of any fluid, and fasten them to a solid body, or keep them asunder, they will be fluid no longer. To produce fluidity, a considerable number of such particles are required; but here they are close, and destitute of their natural properties. Thus, according to him, the world is growing every day harder and harder, and the earth firmer and firmer; and there may come a time when every object around us may be stiffened in universal frigidity! However, we have causes enough of anxiety in this world already, not to add this preposterous concern to the number.

That air also contributes to divide the parts of water, we can have no manner of doubt; some have even disputed whether water be not capable of being turned into air. However, though this cannot be allowed, it must be granted, that it may be turned into a substance which greatly resembles air (as we have seen in the experiment of the œlipile) with all its properties; except that, by cold, this new-made air may be condensed again into water.

But of all the substances which tend to divide the parts of water, fire is the most powerful. Water, when heated into steam, acquires such force, and the parts of it tend to fly off from each other with such violence, that no earthly substance we know of is strong enough to confine them. A single drop of water, converted into steam, has been found capable of raising a weight of twenty tons; and would have raised twenty thousand, were the vessel confining it sufficiently strong, and the fire below increased in proportion.

From this easy yielding of its parts to external pressure, arises the art of determining the specific gravity of bodies by plunging them in water; with many other useful discoveries in that part of natural philosophy, called *hydrostatics*. The laws of this science, which Archimedes began, and Pascal, with some other of the moderns, have much improved, rather belongs to experimental than to natural history. However, I will take leave to mention some of the most striking paradoxes in this branch of science, which are as well confirmed by experiment, as rendered universal by theory. It would, indeed, be unpardonable, while discoursing on the properties of water, to omit giving some account of the manner in which it sustains such immense bulks as we see floating upon its soft and yielding surface: how some bodies, that are known to sink at one time, swim with ease, if their surface be enlarged: how the heaviest body, even gold itself, may be made to swim upon water; and how the lightest, such as cork, shall remain sunk at the bottom: how the pouring in of a single quart of water, will burst a hogshead hooped with iron: and how it ascends, in pipes, from the valley, to travel over the mountain: these are circumstances that are at first surprising; but, upon a slight consideration, lose their wonder.

* In order to conceive the manner in which all these wonders are effected, we must begin by observing that water is possessed of an invariable property, which has not hitherto been mentioned; that of always keeping its surface level and even. Winds, indeed, may raise it into waves: or art spurt it up in fountains; but ever, when left to itself, it sinks into a smooth even surface, of which no part is higher than another. If I should pour water, for instance, into the arm of a pipe of the shape of the letter U, the fluid would rise in the other arm just to the same height; because, otherwise, it would not find its level, which it invariably maintains. A pipe bending from one hill down into the valley, and rising by another, may be considered as a tube of this kind, in which the water, sinking in one arm, rises to maintain its level in the other. Upon this principle all water-pipes depend; which can never raise the water higher than the fountain from which they proceed.

Again, let us suppose for a moment, that the arms of the pipe already mentioned, may be made long or short at pleasure; and let us still further suppose, that there is some obstacle at the bottom of it, which prevents the water poured into one arm, from rising in the other. Now it is evident, that this obstacle at the bottom will sustain a pressure from the water in one arm, equal to what would make it rise in the other; and this pressure will be great, in proportion as the arm filled with water is tall. We may, therefore, generally conclude, that the bottom of every vessel is pressed by a force, in proportion to the height of the water in that vessel. For instance, if the vessel filled with water be forty feet high, the bottom of that vessel will sustain such a pressure as would raise the same water forty feet high, which is very great. From hence we see how extremely apt our pipes, that convey water to the city, are to burst; for descending from a hill of more than forty feet high, they are pressed by the water contained in them, with a force equal to what would raise it to more than forty feet high; and that this is sometimes able to burst a wooden pipe, we can have no room to doubt of.

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* In the above sketch, the manner of demonstrating used by Monsieur D'Alembert is made use of, as the most obvious, and the most satisfactory. Vide Essai sur, &c.

Still recurring to our pipe, let us suppose one of its arms ten times as thick as the other; this will produce no effect whatsoever upon the obstacle below, which we supposed hindered its rise in the other arm; because, how thick soever the pipe may be, its contents would only rise to its own level; and it will, therefore, press the obstacle with a force equal thereto. We may, therefore, universally conclude, that the bottom of any vessel is pressed by its water, not as it is broad or narrow, but in proportion as it is high. Thus the water contained in a vessel not thicker than my finger, presses its bottom as forcibly as the water contained in a hogshead of an equal height; and, if we made holes in the bottoms of both, the water would burst out as forceful from the one as the other. Hence we may, with great ease, burst a hogshead with a single quart of water; and it has been often done. We have only,* for this, to place a hogshead on one end, filled with water; we then bore a hole in its top, into which we plant a narrow tin pipe, of about thirty feet high: by pouring a quart of water into this, at the top, as it continues to rise higher in the pipe, it will press more forcibly on the bottom and sides of the hogshead below, and at last burst it.

Still returning to our simple instrument of demonstration. If we suppose the obstacle at the bottom of the pipe to be moveable, so as that the force of the water can push it up into the other arm; such a body as quicksilver, for instance. Now, it is evident, that the weight of water weighing down upon this quicksilver in one arm, will at last press it up in the other arm; and will continue to press it upward, until the fluid in both arms be upon a par. So that here we actually see quicksilver, the heaviest substance in the world, except gold and platina, floating upon water, which is but a very light substance.

When we see water thus capable of sustaining quicksilver, we need not be surprised that it is capable of floating much lighter substances, ships, animals, or timber. When any thing floats upon water, we always see that a part of it sinks in the same. A cork, a ship, a buoy, each buries itself in a bed on the surface of the water; this bed may be considered as so much water displaced; the water will, therefore, lose so much of its own weight, as is equal to the weight of that bed of water which it displaces. If the body be heavier than a similar bulk of water, it will sink; if lighter, it will swim. Universally, therefore, a body plunged in water, loses as much of its weight as is equal to the weight of a body of water of its own bulk. Some light bodies, therefore, such as cork, lose much of their weight, and therefore swim; other more ponderous bodies sink, because they are heavier than their bulk of water.

Upon this simple theorem entirely depends the art of weighing metals hydrostatically. I have a guinea, for instance, and desire to know whether it be pure gold; I have weighed it in the usual way with another guinea, and find it exactly of the same weight, but still I have some suspicion, from its greater bulk, that it is not pure. In order to determine this, I have nothing more to do than to weigh it in water with that same guinea that I know to be good, and of the same weight; and this will instantly show the difference; for the true ponderous metal will sink, and the false bulky one will be sustained in proportion to the greatness of its surface. Those whose business it is to examine the purity of metals, have a balance made for this purpose, by which they can precisely determine which is most ponderous, or, as it is expressed, which has the greatest specific gravity. Seventy-one pounds and a half of quicksilver is found to be equal in bulk to a hundred pounds weight of gold. In the same proportion sixty of lead, fifty-four of silver, forty-seven of copper, forty five of brass, forty-two of iron, and thirty-nine of tin, are each equal to a hundred pounds of the same most ponderous of all metals.

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* Nollet's Lectures

This method of precisely determining the purity of gold, by weighing in water, was first discovered by Archimedes, to whom mankind have been indebted for many useful discoveries. Hiero, king of Sicily, having sent a certain quantity of gold to be made into a crown, the workman, it seems, kept a part for his own use, and supplied the deficiency with a baser metal. His fraud was suspected by the king, but could not be detected; till applying to Archimedes, he weighed the crown in water; and, by this method, informed the king of the quantity of gold which was taken away.

It has been said, that all fluids endeavour to preserve their level; and, likewise, that a body pressing on the surface, tended to destroy that level. From hence, therefore, it will easily be inferred, that the deeper any body sinks, the greater will be the resistance of the depressed fluid beneath. It will be asked, therefore, as the resistance increases in proportion as the body descends, how comes the body, after it is got a certain way, to sink at all? The answer is obvious. From the fluid above pressing it down with almost as great a force as the fluid beneath presses it up. Take away, by any art, the pressure of the fluid from above, and let only the resistance of the fluid from below be suffered to act, and after the body is gone down very deep, the resistance will be insuperable. To give an instance: a small hole opens in the bottom of a ship at sea, forty feet we will suppose below the surface of the water; through this the water bursts up with great violence; I attempt to stop it with my hand, but it pushes the hand violently away. Here the hand is, in fact, a body attempting to sink upon water, at a depth of forty feet, with the pressure from above taken away. The water, therefore, will overcome my strength; and will continue to burst in till it has got to its level: if I should then dive into the hold, and clap my hand upon the opening, as before, I should perceive no force acting against my hand at all: for the water above presses the hand as much down against the hole, as the water without presses it upward. For this reason, also, when we dive to the bottom of the water, we sustain a very great pressure from above, it is true, but it is counteracted by the pressure from below; and the whole acting uniformly on the surface of the body, wraps us close round without injury.

As I have deviated thus far, I will just mention one or two properties more, which water, and all such like fluids, is found to possess. And, first, their ascending in vessels which are emptied of air, as in our common pumps for instance. The air, however, being the agent in this case, we must previously examine its properties, before we undertake the explanation. The other property to be mentioned is, that of their ascending in small capillary tubes. This is one of the most extraordinary and inscrutable appearances in nature. Glass tubes may be drawn, by means of a lamp, as fine as a hair; still preserving their hollow within. If one of these be planted in a vessel of water, or spirit of wine, the liquor will immediately be seen to ascend; and it will rise higher, in proportion as the tube is smaller; a foot, two feet, and more. How does this come to pass? Is the air the cause? No: the liquor rises, although the air be taken away. Is attraction the cause? No: for quicksilver does not ascend, which it otherwise would. Many have been the theories of experimental philosophers to explain this property. Such as are fond of travelling in the regions of conjecture, may consult Hawksbee, Morgan, Jurin, or Watson, who have examined the subject with great minuteness. Hitherto, however, nothing but doubts, instead of knowledge, have been the result of their inquiries. It will not, therefore, become us to enter into the minuteness of the inquiry, when we have so many great wonders to call our attention away.

CHAPTER XIV.

OF THE ORIGIN OF RIVERS.

"The sun ariseth, and the sun goeth down, and pants for the "place from whence he arose. All things are filled with labour, and "man cannot utter it. All rivers run into the sea, yet the sea is not "full. Unto the place whence the rivers come, thither they return "again. The eye is not satisfied with seeing, nor the ear with hearing."* Thus speaks the wisest of the Jews. And at so early a period was the curiosity of man employed in observing these great circulations of nature. Every eye attempted to explain those appearances; and every philosopher who has long thought upon the subject, seems to give a peculiar solution. The inquiry whence rivers are produced; whence they derive those unceasing stores of water, which continually enrich the world with fertility and verdure, has been variously considered, and divided the opinions of mankind more than any other topic in natural history.

In this contest the various champions may be classed under two leaders. M. De La Hire, who contends that rivers must be supplied from the sea, strained through the pores of the earth; and Dr. Halley, who has endeavoured to demonstrate that the clouds alone are sufficient for the supply.—Both sides have brought in mathematics to their aid; and have shown that long and laborious calculations can at any time be made to obscure both sides of a question.

De La Hire† begins his proofs, that rain-water, evaporated from the sea, is sufficient for the production of rivers; by showing, that rain never penetrates the surface of the earth above sixteen inches. From thence he infers, that it is impossible for it, in many cases, to sink so as to be found at such considerable depths below. Rain-water, he grants, is often seen to mix with rivers, and to swell their currents; but a much greater part of it evaporates. "In fact," continues he, "if we suppose the earth every where covered with water, evaporation alone would be sufficient to carry off two feet nine inches of it in a year: and yet we very well know, that scarce nineteen inches of rain-water falls in that time; so that evaporation would carry off a much greater quantity than is ever known to descend. The small quantity of rain-water that falls is, therefore, but barely sufficient for the purposes of vegetation. Two leaves of a fig-tree have been found, by experiment, to imbibe from the earth, in five hours and a half, two ounces of water. This implies the great quantity of fluid that must be exhausted in the maintenance of one single plant. Add to this, that the waters of the river Rungis will, by calculation, rise to fifty inches; and the whole country from whence they are supplied never receives fifty inches in the year by rain. Besides this, there are many salt springs, which are known to proceed immediately from the sea, and are subject to its flux and reflux. In short, wherever we dig beneath the surface of the earth, except in a very few instances, water is to be found: and it is by this subterraneous water, that springs and rivers, nay, a great part of vegetation itself, is supported. It is this subterraneous water which is raised into steam, by the internal heat of the earth, that feeds plants. It is this subterraneous water that distils through its interstices; and there, cooling, forms fountains. It is this, that, by the addition of rains, is increased into rivers, and pours plenty over the whole earth."

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* Ecclesiastes, chap. i. 5, 7, 8.

† Hist. de l'Acad. 1713, p. 56.

On the other side of the question,* it is asserted, that the vapours which are exhaled from the sea, and driven by the winds upon land, are more than sufficient to supply not only plants with moisture, but also to furnish a sufficiency of water to the greatest rivers. For this purpose, an estimate has been made of the quantity of water emptied at the mouths of the greatest rivers; and of the quantity also raised from the sea by evaporation; and it has been found, that the latter by far exceeds the former. This calculation was made by Mr. Marriotte. By him it was found, upon receiving such rain as fell in a year, in a proper vessel fitted for that purpose, that, one year with another, there might fall about twenty inches of water upon the surface of the earth, throughout Europe. It was also computed that the river Seine, from its source to the city of Paris, might cover an extent of ground, that would supply it annually with above seven billions of cubic feet of this water, formed by evaporation. But upon computing the quantity which passed through the arches of one of its bridges in a year, it was found to amount only to two hundred and eighty millions of cubic feet, which is not above the sixth part of the former number. Hence, therefore, it appears, that this river may receive a supply, brought to it by the evaporated waters of the sea, six times greater than what it gives back to the sea by its current; and therefore, evaporation is more than sufficient for maintaining the greatest rivers, and supplying the purposes also of vegetation.

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* Phil. Trans. vol. ii. p. 128.

In this manner the sea supplies sufficient humidity to the air for furnishing the earth with all necessary moisture. One part of its vapours fall upon its own bosom, before they arrive upon land. Another part is arrested by the sides of mountains, and is compelled, by the rising stream of air, to mount upward towards the summits. Here it is presently precipitated, dripping down by the crannies of the stone. In some places, entering into the caverns of the mountain, it gathers in those receptacles, which being once filled, all the rest overflows; and breaking out by the sides of the hills, forms single springs. Many of these run down by the valleys, or guts, between the ridges of the mountain, and, coming to unite, form little rivulets or brooks; many of these meeting in one common valley, and gaining the plain ground, being grown less rapid, become a river: and many of these uniting, make such vast bodies of water, as the Rhine, the Rhone, and the Danube.

There is still a third part, which falls upon the lower grounds, and furnishes plants with their wonted supply. But the circulation does not rest even here; for it is again exhaled into vapour by the action of the sun; and afterwards returned to that great mass of waters whence it first arose. "This," adds Dr. Halley, "seems the most reasonable hypothesis; and much more likely to be true, than that of those who derive all springs from the filtering of the sea-waters, through certain imaginary tubes or passages within the earth; since it is well known that the greatest rivers have their most copious fountains the most remote from the sea."*

This seems the most general opinion; and yet, after all, it is still pressed with great difficulties; and there is still room to look out for a better theory. The perpetuity of many springs, which always yield the same quantity when the least rain or vapour is afforded, as well as when the greatest, is a strong objection. Derham† mentions a spring at Upminster, which he could never perceive by his eye to be diminished, in the greatest droughts, even when all the ponds in the country, as well as an adjoining brook, have been dry for several months together. In the rainy seasons, also, it was never overflowed; except sometimes, perhaps, for an hour or so, upon the immission of the external rains. He, therefore, justly enough concludes, that had this spring its origin from rain or vapour, there would be found an increase or decrease of its water, corresponding to the causes of its production.

Thus the reader, after having been tossed from one hypothesis to another, must at last be content to settle in conscious ignorance. All that has been written upon this subject, affords him rather something to say, than something to think; something rather for others than for himself. Varenius, indeed, although he is at a loss for the origin of rivers, is by no means so as to their formation. He is pretty positive that all rivers are artificial. He boldly asserts, that their channels have been originally formed by the industry of man. His reasons are, that when a new spring breaks forth, the water does not make itself a new channel, but spreads over the adjacent land. "Thus," says he, "men are obliged to direct its course; or, otherwise, Nature would never have found one." He enumerates many rivers that are certainly known, from history, to have been dug by men. He alleges, that no salt-water rivers are found, because men did not want salt-water; and as for salt, that was procurable at a less expense than digging a river for it. However, it costs a speculative man but a small expense of thinking to form such a hypothesis. It may, perhaps, engross the reader's patience to detain him longer upon it.

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* Phil. Trans. vol. ii. p. 128.

† Derham Physicc Theol.

Nevertheless, though Philosophy be thus ignorant, as to the production of rivers, yet the laws of their motion, and the nature of their currents, have been very well explained. The Italians have particularly distinguished themselves in this respect; and it is chiefly to them that we are indebted for the improvement.*

All rivers have their source either in mountains, or elevated lakes; and it is in their descent from these that they acquire that velocity which maintains their future current. At first their course is generally rapid and headlong; but it is retarded in its journey, by the continual friction against its banks, by the many obstacles it meets to divert its stream, and by the plains generally becoming more level as it approaches towards the sea.

If this acquired velocity be quite spent, and the plain through which the river passes is entirely level, it will, notwithstanding, still continue to run from the perpendicular pressure of the water, which is always in exact proportion to the depth. This perpendicular pressure is nothing more than the weight of the upper waters pressing the lower out of their places, and, consequently, driving them forward, as they cannot recede against the stream. As this pressure is greatest in the deepest parts of the river, so we generally find the middle of the stream most rapid; both because it has the greatest motion thus communicated by the pressure, and the fewest obstructions from the banks on either side.

Rivers thus set into motion are almost always found to make their own beds. Where they find the bed elevated, they wear its substance away, and deposit the sediment in the next hollow, so as in time to make the bottom of their channels even. On the other hand, the water is continually gnawing and eating away the banks on each side; and this with more force as the current happens to strike more directly against them. By these means it always has a tendency to render them more straight and parallel to its own course. Thus it continues to rectify its banks, and enlarge its bed; and, consequently to diminish the force of its stream, till there becomes an equilibrium between the force of the water, and the resistance of its banks, upon which both will remain without any further mutation. And it is happy for man that bounds are thus put to the erosion of the earth by water; and that we find all rivers only dig and widen themselves but to a certain degree.†

In those plains‡ and large valleys where great rivers flow, the bed of the river is usually lower than any part of the valley. But it often happens, that the surface of the water is higher than many of the grounds that are adjacent to the banks of the stream. If, after inundations, we take a view of some rivers, we shall find their banks appear above water, at a time that all the adjacent valley is overflowed. This proceeds from the frequent deposition of mud, and such like substances, upon the banks, by the rivers frequently overflowing; and thus, by degrees, they become elevated above the plain; and the water is often seen higher also.

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* S. Guglielmini della Natura de Fiumi, passim. † Ibid

‡ Buffon, de Fleuves, passim. vol. ii.

Rivers, as every body has seen, are always broadest at the mouth, and grow narrower towards their source. But what is less known, and probably more deserving curiosity, is, that they run in a more direct channel as they immediately leave their sources; and that their sinuosities and turnings become more numerous as they proceed. It is a certain sign among the savages of North America, that they are near the sea when they find the rivers winding, and every now and then changing their direction. And this is even now become an indication to the Europeans themselves, in their journeys through those trackless forests. As those sinuosities, therefore, increase as the river approaches the sea, it is not to be wondered at that they sometimes divide, and thus disembogue by different channels. The Danube disembogues into the Euxine by seven mouths; the Nile by the same number; and the Wolga by seventy.

The currents* of rivers are to be estimated very differently from the manner in which those writers who have given us mathematical theories on this subject, represent them. They found their calculations upon the surface being a perfect plain from one bank to the other: but this is not the actual state of nature; for rivers, in general, rise in the middle; and this convexity is greatest in proportion as the rapidity of the stream is greater. Any person to be convinced of this, need only lay his eye, as nearly as he can, on a level with the stream, and looking across to the opposite bank, he will perceive the river in the midst to be elevated considerably above what it is at the edges. This rising, in some rivers, is often found to be three feet high; and is ever increased in proportion to the rapidity of the stream. In this case, the water in the midst of the current loses a part of its weight, from the velocity of its motion; while that at the sides, for the contrary reason, sinks lower. It sometimes, however, happens, that this appearance is reversed; for when tides are found to flow up with violence against the natural current of the water, the greatest rapidity is then found at the sides of the river, as the water there least resists the influx from the sea. On those occasions, therefore, the river presents a concave rather than a convex surface; and, as in the former case, the middle waters rose in a ridge, in this case they sink in a furrow.

The stream of all rivers is more rapid in proportion as its channel is diminished. For instance, it will be much swifter where it is ten yards broad, than where it is twenty; for the force behind still pushing the water forward, when it comes to the narrow part, it must make up by velocity what it wants in room.

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* Buffon, de Fleuves, passim, vol. ii

It often happens that the stream of a river is opposed by one of its jutting banks, by an island in the midst, the arches of a bridge, or some such obstacle. This produces not unfrequently a back current; and the water having passed the arch with great velocity, pushes the water on each side of its direct current. This produces a side current, tending to the bank; and not unfrequently a whirlpool; in which a large body of waters are circulated in a kind of cavity, sinking down in the middle. The central point of the whirlpool is always lowest, because it has the least motion: the other parts are supported, in some measure, by the violence of theirs, and consequently rise higher, as their motion is greater; so that towards the extremity of the whirlpool must be higher, than towards the centre.

If the stream of a river be stopped at the surface, and yet be free below; for instance, if it be laid over by a bridge of boats, there will then be a double current; the water at the surface will flow back, while that at the bottom will proceed with increased velocity. It often happens that the current at the bottom is swifter than at the top, when upon violent land-floods, the weight of waters toward the source, presses the waters at the bottom, before it has had time to communicate its motion to the surface. However, in all other cases, the surface of the stream is swifter than the bottom, as it is not retarded by rubbing over the bed of the river.

It might be supposed that bridges, dams, and other obstacles in the current of a river, would retard its velocity. But the difference they make is very inconsiderable. The water, by these stoppages, gets an elevation above the object; which, when it has surmounted, it gives a velocity that recompenses the former delay. Islands and turnings also retard the course of the stream but very inconsiderably; any cause which diminishes the quantity of the water, most sensibly diminishes the force and the velocity of the stream.

An increase* of water in the bed of the river always increases its rapidity; except in cases of inundation. The instant the river has overflowed its banks, the velocity of its current is always turned that way, and the inundation is perceived to continue for some days; which it would not otherwise do, if, as soon as the cause was discontinued, it acquired its former rapidity.

A violent storm, that sets directly up against the course of the stream, will always retard, and sometimes entirely stop its course. I have seen an instance of this, when the bed of a large river was left entirely dry for some hours, and fish were caught among the stones at the bottom.

Inundations are generally greater towards the source of rivers than farther down; because the current is generally swifter below than above; and that for the reasons already assigned.

A little river† may be received into a large one, without augmenting either its width or depth. This, which at first view seems a paradox, is yet very easily accounted for. The little river, in this case, only goes towards increasing the swiftness of the larger, and putting its dormant waters into motion. In this manner the Venetian branch of the Po was pushed on by the Ferarese branch and that of Panaro, without any enlargement of its breadth or depth from these accessions.

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* Buffon, vol. ii. p. 62.

† Guglielmini.

A river tending to enter another, either perpendicularly, or in an opposite direction, will be diverted by degrees from that direction; and be obliged to make itself a more favourable entrance downward, and more conspiring with the stream of the former.

The union of two rivers into one, makes it flow the swifter: since the same quantity of water, instead of rubbing against four shores, now only rubs against two.—And, besides, the current being deeper, becomes, of consequence, more fitted for motion.

With respect to the places from whence rivers proceed, it may be taken for a general rule, that the largest* and highest mountains supply the greatest and most extensive rivers. It may be also remarked, in whatever direction the ridge of the mountain runs, the river takes an opposite course. If the mountain, for instance, stretches from north to south, the river runs from east to west; and so contrariwise. These are some of the most generally received opinions with regard to the course of rivers; however, they are liable to many exceptions; and nothing but an actual knowledge of each particular river can furnish us with an exact theory of its current.

The largest rivers of Europe are, first, the Wolga, which is about six hundred and fifty leagues in length, extending from Reschow to Astrachan. It is remarkable of this river, that it abounds with water during the summer months of May and June; but all the rest of the year is so shallow as scarce to cover its bottom, or allow a passage for loaded vessels that trade up its stream. It was up this river that the English attempted to trade into Persia, in which they were so unhappily disappointed, in the year 1741. The next in order is the Danube. The course of this is but about four hundred and fifty leagues, from the mountains of Switzerland to the Black Sea. It is so deep between Buda and Belgrade, that the Turks and Christians have fleets of men of war upon it; which frequently engaged, during the last war between the Ottomans and the Austrians; however, it is unnavigable further down, by reason of its cataracts, which prevent its commerce into the Black Sea. The Don, or Tanais, which is four hundred leagues from the source of that branch of it called the *Softna*, to its mouth in the Euxine Sea. In one part of its course, it approaches near the Wolga; and Peter the Great had actually begun a canal, by which he intended joining those two rivers; but this he did not live to finish. The Nieper, or Boristhenes, which rises in the middle of Muscovy, and runs a course of three hundred and fifty leagues, to empty itself into the Black Sea. The Old Cossacks inhabit the banks and islands of this river; and frequently cross the Black Sea, to plunder the maritime places on the coasts of Turkey. The Dwina; which takes its rise in a province of the same name in Russia, that runs a course of three hundred leagues, and disembogues into the White Sea, a little below Archangel.

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* Dr. Halley.

The largest rivers of Asia are, the Hoanho, in China, which is eight hundred and fifty leagues in length, computing from its source at Raja Ribron, to its mouth in the Gulf of Changi. The Jenisca of Tartary, about eight hundred leagues in length, from the lake Selinga, to the Icy Sea. This river is, by some, supposed to supply most of that great quantity of drift wood which is seen floating in the seas, near the Arctic circle. The Oby, of five hundred leagues, running from the lake of Kila into the Northern Sea. The Amour, in Eastern Tartary, whose course is about five hundred and seventy-five leagues, from its source to its entrance into the sea of Kamtschatka. The Kiam, in China, five hundred and fifty leagues in length. The Ganges, one of the most noted rivers in the world, and about as long as the former. It rises in the mountains which separate India from Tartary; and running through the dominions of the Great Mogul, discharges itself by several mouths into the bay of Bengal. It is not only esteemed by the Indians for the depth and pureness of its stream, but for a supposed sanctity which they believe to be in its waters. It is visited annually by several hundred thousand pilgrims, who pay their devotions to the river as to a god: for savage simplicity is always known to mistake the blessings of the Deity, for the Deity himself. They carry their dying friends from distant countries, to expire on its banks; and to be buried in its stream. The water is lowest in April or May; but the rains beginning to fall soon after, the flat country is overflowed for several miles, till about the end of September; the waters then begin to retire, leaving a prolific sediment behind, that enriches the soil, and, in a few days' time, gives a luxuriance to vegetation, beyond what can be conceived by a European. Next to this may be reckoned the still more celebrated river Euphrates. This rises from two sources, northward of the city Erzerum, in Turcomania, and unites about three days' journey below the same, from whence, after performing a course of five hundred leagues, it falls into the gulf of Persia, fifty miles below the city of Bassora in Arabia. The river Indus is extended from its source to its discharge into the Arabian Sea, four hundred leagues.

The largest rivers of Africa are, the Senegal, which runs a course of not less than eleven hundred leagues, comprehending the Niger, which some have supposed to fall into it. However, later accounts seem to affirm that the Niger is lost in the sands, about three hundred miles up from the western coasts of Africa. Be this as it may, the Senegal is well known to be navigable for more than three hundred leagues up the country; and how much higher it may reach is not yet discovered, as the dreadful fatality of the inland parts of Africa, not only deters curiosity, but even avarice, which is a much stronger passion. At the end of last war, of fifty Englishmen that were sent to the factory at Galam, a place taken from the French, and nine hundred miles up the river, only one returned to tell the fate of his companions, who were destroyed by the climate. The celebrated river Nile is said to be nine hundred and seventy leagues, from its source among the Mountains of the Moon, in Upper Æthiopia, to its opening into the Mediterranean Sea. The sources of this river were considered as inscrutable by the ancients; and the causes of its periodi ea. inundation were equally unknown. They have both been ascertained by the missionaries who have travelled into the interior parts of Æthiopia. The Nile takes its rise in the kingdom of Gojam,* from a small aperture on the top of a mountain, which, though not above a foot and a half over, yet was unfathomable. This fountain, when arrived at the foot of the mountain, expands into a river; and being joined by others, forms a lake thirty leagues long, and as many broad; from this, its channel, in some measure, winds back to the country where it first began; from thence, precipitating by frightful cataracts, it travels through a variety of desert regions, equally formidable, such as Amhara, Olaca, Damot, and Xaoa. Upon its arrival in the kingdom of Upper Egypt, it runs through a rocky channel, which some late travellers have mistaken for its cataracts. In the beginning of its course, it receives many lesser rivers into it; and Pliny was mistaken, in saying that it received none. In the beginning also of its course, it has many windings; but, for above three hundred leagues from the sea, it runs in a direct line. Its annual overflowings arise from a very obvious cause, which is almost universal with the great rivers that take their source near the line. The rainy season, which is periodical in those climates, floods the rivers; and as this always happens in our summer, so the Nile is at that time overflown. From these inundations, the inhabitants of Egypt derive happiness and plenty; and, when the river does not arise to its accustomed heights, they prepare for an indifferent harvest. It begins to overflow about the seventeenth of June; it generally continues to augment for forty days, and decreases in about as many more. The time of increase and decrease, however, is much more inconsiderable now than it was among the ancients. Herodotus informs us, that it was a hundred days rising, and as many falling; which shows that the inundation was much greater at that time than at present. Mr. Buffon† has ascribed the present diminution, as well to the lessening of the Mountains of the Moon, by their substance having so long been washed down with the stream, as to the rising of the earth in Egypt, that has for so many ages received this extraneous supply. But we do not find, by the buildings that have remained since the times of the ancients, that the earth is much raised since then. Besides the Nile in Africa, we may reckon the Zara, and the Coanza, from the greatness of whose openings into the sea, and the rapidity of whose streams, we form an estimate of the great distance from whence they come. Their courses, however, are spent in watering deserts and savage countries, whose poverty or fierceness have kept strangers away.

But of all parts of the world, America, as it exhibits the most lofty mountains, so also it supplies the largest rivers. The foremost of these is the great river Amazon, which, from its source in the lake of Lauricocha, to its discharge into the Western Ocean, performs a course of more than twelve hundred leagues.‡ The breadth and depth of this river are answerable to its vast length; and, where its width is most contracted, its depth is augmented in proportion. So great is the body of its waters, that other rivers, though before the objects of

* Kircher Mundt. Subt. vol. ii. p. 72. † Buffon, vol. ii. p. 82. ‡ Ulloa, vol. i. p. 388

admiration, are lost in its bosom. It proceeds, after their junction, with its usual appearance, without any visible change in its breadth or rapidity; and, if we may so express it, remains great without ostentation. In some places it displays its whole magnificence, dividing into several large branches, and encompassing a multitude of islands; and, at length, discharges itself into the ocean, by a channel of a hundred and fifty miles broad. Another river, that may almost rival the former, is the St. Lawrence, in Canada, which rising in the lake Assiniboils, passes from one lake to another, from Christineaux to Alempigo; from thence to lake Superior; thence to the lake Hurons; to lake Erie; to lake Ontario; and, at last, after a course of nine hundred leagues, pours their collected waters into the Atlantic Ocean. The river Mississippi is of more than seven hundred leagues in length, beginning at its source near the lake Assiniboils, and ending at its opening into the gulf of Mexico. The river Plate runs a length of more than eight hundred leagues from its source in the river Parana, to its mouth. The river Oroonoko is seven hundred and fifty-five leagues in length, from its source near Pasto, to its discharge into the Atlantic Ocean.

Such is the amazing length of the greatest rivers; and even in some of these, the most remote sources very probably yet continue unknown. In fact, if we consider the number of rivers which they receive, and the little acquaintance we have with the regions through which they run, it is not to be wondered at that geographers are divided concerning the sources of most of them. As among a number of roots by which nourishment is conveyed to a stately tree, it is difficult to determine precisely that by which the tree is chiefly supplied; so among the many branches of a great river, it is equally difficult to tell which is the original. Hence it may easily happen, that a smaller branch is taken for the capital stream; and its runnings are pursued, and delineated, in prejudice of some other branch that better deserved the name and the description. In this manner* in Europe, the Danube is known to receive thirty lesser rivers: the Wolga, thirty-two or thirty-three. In Asia, the Hohano receives thirty-five; the Jenisca above sixty; the Oby as many; the Amour about forty; the Nauquin receives thirty rivers; the Ganges twenty; and the Euphrates about eleven. In Africa, the Senegal receives more than twenty rivers; the Nile receives not one for five hundred leagues upwards, and then only twelve or thirteen. In America, the river Amazon receives above sixty, and those very considerable; the river St. Lawrence about forty, counting those which fall into its lakes; the Mississippi receives forty; and the river Plate above fifty.

I mentioned the inundations of the Ganges and the Nile, but almost every other great river whose source lies within the tropics, have their stated inundations also. The river Pegu has been called, by travellers, the Indian Nile, because of the similar overflowings of its stream: this it does to an extent of thirty leagues on each side: and so fertilizes the soil, that the inhabitants send great quantities of rice into other countries, and have still abundance for their own consumption. The river Senegal has likewise its inundations, which cover the whole flat country of Negroland, beginning and ending much about the same time with those of the Nile: as, in fact, both rivers rise from the same mountains. But the difference between the effects of the inundations in each river is remarkable: in the one, it distributes health and plenty: in the other, diseases, famine, and death. The inhabitants along the torrid coasts of the Senegal, can receive no benefit from any additional manure the river may carry down to their soil, which is by nature more than sufficiently luxuriant; or, even if they could they have not industry to turn it to any advantage. The banks, therefore, of the river, lie uncultivated, overgrown with rank and noxious herbage, and infested with thousands of animals of various malignity. Every new flood only tends to increase the rankness of the soil, and to provide fresh shelter for the creatures that infest it. If the flood continues but a few days longer than usual, the improvident inhabitants, who are driven up in the higher grounds, want provisions, and a famine ensues. When the river begins to return into its channel, the humidity and heat of the air are equally fatal; and the carcasses of infinite numbers of animals, swept away by the inundation, putrefying in the sun, produce a stench that is almost insupportable. But even the luxuriance of the vegetation becomes a nuisance. I have been assured, by persons of veracity who have been up the river Senegal, that there are some plants growing along the coast, the smell of which is so powerful, that it is hardly to be endured. It is certain, that all the sailors and soldiers who have been at any of our factories there, ascribe the unwholesomeness of the voyage up the stream, to the vegetable vapour. However this be, the inundations of the rivers in this wretched part of the globe, contribute scarce any advantage, if we except the beauty of the prospects which they afford. These, indeed, are finished beyond the utmost reach of art: a spacious glassy river, with its banks here and there fringed to the very surface by the mangrove-tree, that grows down into the water, presents itself to view; lofty forests of various colours, with openings between, carpeted with green plants, and the most gaudy flowers; beasts and animals, of various kinds, that stand upon the banks of the river, and, with a sort of wild curiosity, survey the mariners as they pass, contribute to heighten the scene. This is the sketch of an African prospect; which delights the eye, even while it destroys the constitution.

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* Buffon, vol. ii. p. 74.

Besides these annually periodical inundations, there are many rivers that overflow at much shorter intervals. Thus most of those in Peru and Chili have scarce any motion by night; but upon the appearance of the morning sun, they resume their former rapidity; this proceeds from the mountain snows, which melting with the heat, increase the stream, and continue to drive on the current while the sun continues to dissolve them. Some rivers also flow with an even steady current, from their source to the sea; others flow with greater rapidity, their stream being poured down in a cataract, or swallowed by the sands, before they reach the sea.

The rivers of those countries that have been least inhabited, are usually more rocky, uneven, and broken into water-falls or cataracts.

than those where the industry of man has been more prevalent. Wherever man comes, nature puts on a milder appearance: the terrible and the sublime, are exchanged for the gentle and the useful; the cataract is sloped away into a placid stream; and the banks become more smooth and even.* It must have required ages to render the Rhone or the Loire navigable: their beds must have been cleaned and directed; their inequalities removed; and by a long course of industry, Nature must have been taught to conspire with the desires of her controller. Every one's experience must have supplied instances of rivers thus being made to flow more evenly, and more beneficially to mankind; but there are some whose currents are so rapid, and falls so precipitate, that no art can obviate; and that must for ever remain as amazing instances of incorrigible Nature.

Of this kind are the cataracts of the Rhine; one of which I have seen exhibit a very strange appearance; it was that at Schaffhausen, which was frozen quite across, and the water stood in columns where the cataract had formerly fallen. The Nile, as was said, has its cataracts. The river Vologda, in Russia, has two. The river Zara, in Africa, has one near its source. The river Velino, in Italy, has a cataract of above a hundred and fifty feet perpendicular. Near the city of Gottenburgh,† in Sweden, the river rushes down from a prodigious high precipice, into a deep pit, with a terrible noise, and such dreadful force, that those trees designed for the masts of ships, which are floated down the river, are usually turned upside down in their fall, and often are shattered to pieces, by being dashed against the surface of the water in the pit; this occurs if the masts fall sideways upon the water; but if they fall endways, they dive so far under water, that they disappear for a quarter of an hour, or more: the pit, into which they are thus plunged, has been often sounded with a line of some hundred fathoms long, but no ground has been found hitherto. There is also a cataract at Powerscourt, in Ireland, in which, if I am rightly informed, the water falls three hundred feet perpendicular; which is a greater descent than that of any other cataract in any part of the world. There is a cataract at Albany, in the province of New-York, which pours its stream fifty feet perpendicular. But of all the cataracts in the world, that of Niagara, in Canada, if we consider the great body of water that falls, must be allowed to be the greatest, and the most astonishing.

This amazing fall of water is made by the river St. Lawrence, in its passage from the lake Erie into the lake Ontario. We have already said that the St. Lawrence was one of the largest rivers in the world; and yet the whole of its waters are here poured down, by a fall of a hundred and fifty feet perpendicular. It is not easy to bring the imagination to correspond with the greatness of the scene; a river, extremely deep and rapid, and that serves to drain the waters of almost all North America into the Atlantic ocean, is here poured precipitately down a ledge of rocks, that rise, like a wall, across the whole bed of its stream. The width of the river a little above, is near three quarters of a mile broad; and the rocks, where it grows narrower, are four hundred yards over. Their direction is not straight across, but hollowing inwards like a horse-shoe; so that the cataract, which bends to the shape of the obstacle, rounding inwards, presents a kind of theatre the most tremendous in nature. Just in the middle of this circular wall of waters, a little island, that has braved the fury of the current, presents one of its points, and divides the stream at top into two; but it unites again long before it has got to the bottom. The noise of the fall is heard at several leagues distance; and the fury of the waters at the bottom of their fall is inconceivable. The dashing produces a mist that rises to the very clouds; and that produces a most beautiful rainbow, when the sun shines. It may easily be conceived, that such a cataract quite destroys the navigation of the stream; and yet some Indian canoes, as it is said, have been known to venture down it with safety.

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* Buffon, vol. ii. p. 90.

† Phil. Trans. vol. ii. p. 375.

Of those rivers that lose themselves in the sands, or are swallowed up by chasms in the earth, we have various information. What we are told by the ancients, of the Alpheus, in Arcadia, that sinks into the ground, and rises again near Syracuse in Sicily, where it takes the name of Arethusa, is rather more known than credited. But we have better information with respect to the river Tigris being lost in this manner under mount Taurus; of the Guadalquiver in Spain, being buried in the sands; of the river Greatah, in Yorkshire, running under ground, and rising again; and even of the great Rhine itself, a part of which is no doubt lost in the sands, a little above Leyden. But it ought to be observed of this river, that by much the greatest part arrives at the ocean; for, although the ancient channel which fell into the sea, a little to the west of that city, be now entirely choaked up, yet there are still a number of small canals, that carry a great body of waters to the sea; and, besides, it has also two very large openings, the Lech, and the Waal, below Rotterdam, by which it empties itself abundantly.

Be this as it will, nothing is more common in sultry and sandy deserts, than rivers being thus either lost in the sands, or entirely dried up by the sun. And hence we see, that under the line, the small rivers are but few; for such little streams as are common in Europe, and which with us receive the name of rivers, would quickly evaporate, in those parching and extensive deserts. It is even confidently asserted, that the great river Niger is thus lost before it reaches the ocean; and that its supposed mouths, the Gambia and the Senegal, are distinct rivers, that come a vast way from the interior parts of the country. It appears, therefore, that the rivers under the line are large; but it is otherwise at the poles,* where they must necessarily be small. In that desolate region, as the mountains are covered with perpetual ice, which melts but little, or not at all, the springs and rivulets are furnished with a very small supply. Here, therefore, men and beasts would perish, and die for thirst, if Providence had not ordered, that in the hardest winter, thaws should intervene, which deposit a small quantity of snow-water in pools under the ice; and from this source the wretched inhabitants drain a scanty beverage.

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* Crantz's History of Greenland, vol. I. p. 41

Thus, whatever quarter of the globe we turn to, we shall find new reasons to be satisfied with that part of it in which we reside. Our rivers furnish all the plenty of the African stream, without its inundation; they have all the coolness of the polar rivulet, with a more constant supply; they may want the terrible magnificence of huge cataracts, or extensive lakes, but they are more navigable, and more transparent; though less deep and rapid than the rivers of the torrid zone, they are more manageable, and only wait the will of man to take their direction. The rivers of the torrid zone, like the monarchs of the country, rule with despotic tyranny; profuse in their bounties, and ungovernable in their rage. The rivers of Europe, like their kings, are the friends, and not the oppressors of the people; bounded by known limits, abridged in the power of doing ill, directed by human sagacity, and only at freedom to distribute happiness and plenty

CHAPTER XV.

OF THE OCEAN IN GENERAL; AND OF ITS SALTNESS.

If we look upon a map of the world, we shall find that the ocean occupies considerably more of the globe, than the land is found to do. This immense body of water is diffused round both the Old and New Continent, to the south; and may surround them also to the north, for what we know, but the ice in those regions has stopped our inquiries. Although the ocean, properly speaking, is but one extensive sheet of waters, continued over every part of the globe, without interruption, and although no part of it is divided from the rest, yet geographers have distinguished it by different names; as the Atlantic or Western Ocean, the Northern Ocean, the Southern Ocean, the Pacific Ocean, and the Indian Ocean. Others have divided it differently, and given other names; as the Frozen Ocean, the Inferior Ocean, or the American Ocean. But all these being arbitrary distinctions, and not of Nature's making, the naturalist may consider them with indifference.

In this vast receptacle, almost all the rivers of the earth ultimately terminate; nor do such great supplies seem to increase its stores; for it is neither apparently swollen by their tribute, nor diminished by their failure; it still continues the same. Indeed, what is the quantity of water of all the rivers and lakes in the world, compared to that contained in this great receptacle?* If we should offer to make a rude estimate, we shall find that all the rivers in the world, flowing into the bed of the sea, with a continuance of their present stores, would take up at least eight hundred years to fill it to its present height. For, supposing the sea to be eighty-five millions of square miles in extent, and a quarter of a mile, upon an average, in depth, this, upon calculation, will give about twenty-one millions of cubic miles of water, as the contents of the whole ocean. Now, to estimate the quantity of water which all the rivers supply, take any one of them; the Po, for

* Buffon, vol. ii. p. 70.

instance, the quantity of whose discharge into the sea, is known to be one cubic mile of water in twenty-six days. Now it will be found, upon a rude computation, from the quantity of ground the Po, with its influent streams, covers, that all the rivers of the world furnish about two thousand times that quantity of water. In the space of a year, therefore, they will have discharged into the sea about twenty-six thousand cubic miles of water; and not till eight hundred years, will they have discharged as much water as is contained in the sea at present. I have not troubled the reader with the odd numbers, lest he should imagine I was giving precision to a subject that is incapable of it.

Thus great is the assemblage of waters diffused round our habitable globe; and yet immeasurable as they seem, they are mostly rendered subservient to the necessities and the conveniences of so little a being as man. Nevertheless, if it should be asked whether they be made for him alone, the question is not easily resolved. Some philosophers have perceived so much analogy to man in the formation of the ocean, that they have not hesitated to assert its being made for him alone. The distribution of land and water,* say they, is admirable: the one being laid against the other so skilfully, that there is a just equipoise of the whole globe. Thus the Northern Ocean balances against the Southern; and the New Continent is an exact counterweight to the Old. As to any objection from the ocean's occupying too large a share of the globe, they contend, that there could not have been a smaller surface employed to supply the earth with a due share of evaporation. On the other hand, some take the gloomy side of the question; they either magnify† its apparent defects; or assert, that‡ what seem defects to us, may be real beauties to some wiser order of beings. They observe, that multitudes of animals are concealed in the ocean, and but a small part of them are known; the rest therefore, they fail not to say, were certainly made for their own benefit, and not for ours. How far either of these opinions be just, I will not presume to determine; but of this we are certain, that God has endowed us with abilities to turn this great extent of waters to our own advantage. He has made these things, perhaps, for other uses; but he has given us faculties to convert them to our own. The much agitated question, therefore, seems to terminate here. We shall never know whether the things of this world have been made for our use; but we very well know that we have been made to enjoy them. Let us then boldly affirm, that the earth, and all its wonders, are ours; since we are furnished with powers to force them into our service. Man is the lord of all the sublunary creation; the howling savage, the winding serpent, with all the untameable and rebellious offspring of Nature, are destroyed in the contest, or driven at a distance from his habitations. The extensive and tempestuous ocean, instead of limiting or dividing his power, only serves to assist his industry, and enlarge the sphere of his enjoyments. Its billows, and its monsters, instead of presenting a scene of terror, only call up the courage of this little intrepid being; and the greatest danger that man now fears on the deep, is from his fellow creatures. Indeed, when I consider the human race as Nature has formed them, there is but very little of the habitable globe that seems made for them. But when I consider them as accumulating the experience of ages, in commanding the earth, there is nothing so great or so terrible. What a poor contemptible being is the naked savage, standing on the beach of the ocean, and trembling at its tumults! How little capable is he of converting its terrors into benefits; or of saying, Behold an element made wholly for my enjoyments! He considers it as an angry deity, and pays it the homage of submission. But it is very different when he has exercised his mental powers; when he has learned to find his own superiority, and to make it subservient to his commands. It is then that his dignity begins to appear, and that the true Deity is justly praised for having been mindful of man; for having given him the earth for his habitation, and the sea for an inheritance.

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* Derham Physico-Theol. † Burnet's Theory, passim. ‡ Pope's Ethic Epistles, passim.

This power which man has obtained over the ocean, was at first enjoyed in common; and none pretended to a right in that element where all seemed intruders. The sea, therefore, was open to all till the time of the emperor Justinian. His successor Leo granted such as were in possession of the shore, the sole right of fishing before their respective territories. The Thracian Bosphorus was the first that was thus appropriated; and from that time it has been the struggle of most of the powers of Europe to obtain an exclusive right in this element. The republic of Venice claims the Adriatic. The Danes are in the possession of the Baltic. But the English have a more extensive claim to the empire of all the seas, encompassing the kingdoms of England, Scotland, and Ireland; and although these have been long contested, yet they are now considered as their indisputable property. Every one knows that the great power of the nation is exerted on this element; and that the instant England ceases to be superior upon the ocean, its safety begins to be precarious.

It is in some measure owing to our dependence upon the sea, and to our commerce there, that we are so well acquainted with its extent and figure. The bays, gulfs, currents, and shallows of the ocean, are much better known and examined, than the provinces and kingdoms of the earth itself. The hopes of acquiring wealth by commerce, has carried man to much greater length than the desire of gaining information could have done. In consequence of this, there is scarce a strait or a harbour, scarce a rock or a quicksand, scarce an inflection of the shore, or the jutting of a promontory, that has not been minutely described. But as these present very little entertainment to the imagination, or delight to any but those whose pursuits are lucrative, they need not be dwelt upon here. While the merchant and the mariner are solicitous in describing currents and soundings, the naturalist is employed in observing wonders, though not so beneficial, yet to him of a much more important nature. The saltness of the sea seems to be the foremost.

Whence the sea has derived that peculiar bitterish saltness which we find in it, appears, by Aristotle, to have exercised the curiosity of naturalists in all ages. He supposed (and mankind were for ages content with the solution) that the sun continually raised dry saline ex halations from the earth, and deposited them upon the sea; and hence, say his followers, the waters of the sea are more salt at top than at bottom. But, unfortunately for this opinion, neither of the facts is true. Sea-salt is not to be raised by the vapours of the sun; and sea-water is not salter at the top than at the bottom. Father Bohours is of opinion, that the Creator gave the waters of the ocean their saltness at the beginning; not only to prevent their corruption, but to enable them to bear greater burthens. But their saltness does not prevent their corruption; for stagnant sea-water, like fresh, soon grows putrid: and, as for their bearing greater burthens, fresh-water answers all the purposes of navigation quite as well. The established opinion, therefore, is that of Boyle,* who supposes, "That the sea's saltness is supplied not only from rocks or masses of salt at the bottom of the sea, but also from the salt which the rains and rivers, and other waters, dissolve in their passage through many parts of the earth, and at length carry with them to the sea." But as there is a difference in the taste of rock-salt found at land, and that dissolved in the waters of the ocean, this may be produced by the plenty of nitrous and bituminous bodies that, with the salts, are likewise washed into that great receptacle. These substances being thus once carried to the sea, must for ever remain there; for they do not rise by evaporation, so as to be returned back from whence they came. Nothing but the fresh waters of the sea rise in vapours; and all the saltness remains behind. From hence it follows, that every year the sea must become more and more salt; and this speculation, Dr. Halley carries so far, as to lay down a method of finding out the age of the world by the saltness of its waters. "For if it be observed,"† says he, "what quantity of salt is at present contained in a certain weight of water taken up from the Caspian Sea, for example, and, after some centuries, what greater quantity of salt is contained in the same weight of water, taken from the same place; we may conclude, that in proportion as the saltness has increased in a certain time, so much must it have increased before that time; and we may thus, by the rule of proportion, make an estimate of the whole time wherein the water would acquire the degree of saltness it should be then possessed of." All this may be fine; however, an experiment, begun in this century, which is not to be completed till some centuries hence, is rather a little mortifying to modern curiosity; and, I am induced to think, the inhabitants round the Caspian Sea, will not be apt to undertake the inquiry.

This saltness is found to prevail in every part of the ocean: and as much at the surface as at the bottom. It is also found in all those seas that communicate with the ocean; but rather in a less degree.

The great lakes, likewise, that have no outlets nor communication with the ocean, are found to be salt; but some of them in less proportion. On the contrary, all those lakes through which rivers run into the sea, however extensive they be, are, notwithstanding, very fresh: for the rivers do not deposit their salts in the bed of the lake, but carry them with their currents into the ocean. Thus the lakes Ontario and Erie, in North America, although for magnitude they may be considered as inland seas, are, nevertheless, fresh-water lakes; and kept so by the river St. Lawrence, which passes through them. But those lakes that have no communication with the sea, nor any rivers going out, although they be less than the former, are, however, always salt. Thus, that which goes by the name of the Dead Sea, though very small, when compared to those already mentioned, is so exceedingly salt, that its waters seem scarcely capable of dissolving any more. The lakes of Mexico and of Titicaca, in Peru, though of no great extent, are, nevertheless, salt; and both for the same reason.

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* Boyle, vol. iii. p. 221.

† Phil. Trans. vol. v. p. 218.

Those who are willing to turn all things to the best, have not failed to consider this saltness of the sea, as a peculiar blessing from Providence, in order to keep so great an element sweet and wholesome. What foundation there may be in the remark, I will not pretend to determine; but we shall shortly find a much better cause for its being kept sweet, namely, its motion.

On the other hand, there have been many who have considered the subject in a different light, and have tried every endeavour to make salt-water fresh, so as to supply the wants of mariners in long voyages, or when exhausted of their ordinary stores. At first it was supposed simple distillation would do; but it was soon found that the bitter part of the water still kept mixed. It was then tried by uniting salt of tartar with sea-water, and distilling both; but here the expense was greater than the advantage. Calcined bones were next thought of; but a hogshead of calcined bones, carried to sea, would take up as much room as a hogshead of water, and was more hard to be obtained. In this state, therefore, have the attempts to sweeten sea-water rested; the chymist satisfied with the reality of his invention; and the mariner convinced of its being useless. I cannot, therefore, avoid mentioning a kind of succedaneum which has been lately conceived to answer the purposes of fresh-water, when mariners are quite exhausted. It is well known, that persons who go into a warm bath, come out several ounces heavier than they went in; their bodies having imbibed a correspondent quantity of water. This more particularly happens, if they have been previously debarred from drinking, or go in with a violent thirst; which they quickly find quenched, and their spirits restored. It was supposed, that in case of a total failure of fresh-water at sea, a warm bath might be made of sea-water, for the use of mariners; and that their pores would thus imbibe the fluid, without any of its salts, which would be seen to crystallize on the surface of their bodies. In this manner, it is supposed, a sufficient quantity of moisture may be procured to sustain life, till time or accident furnish a more copious supply.

But, however this be, the saltness of the sea can by no means be considered as a principal cause in preserving its waters from putrefaction. The ocean has its currents, like rivers, which circulate its contents round the globe; and these may be said to be the great agents that keep it sweet and wholesome. Its saltness alone would by no means answer this purpose: and some have even imagined, that the various substances with which it is mixed, rather tend to promote putrescence than impede it. Sir Robert Hawkins, one of our most enlightened navigators*, gives the following account of a calm, in which the sea, continuing for some time without motion, began to assume a very formidable appearance. "Were it not," says he, "for the moving of the sea, by the force of winds, tides, and currents, it would corrupt all the world. The experiment of this I saw in the year 1590, lying with a fleet about the islands of Azores, almost six months; the greatest part of which time we were becalmed. Upon which all the sea became so replenished with several sorts of jellies, and forms of serpents, adders, and snakes, as seemed wonderful some green, some black, some yellow, some white, some of divers colours; and many of them had life; and some there were a yard and a half, and two yards long; which, had I not seen, I could hardly have believed. And hereof are witnesses all the company of the ships which were then present; so that hardly a man could draw a bucket of water clear of some corruption. In which voyage, towards the end thereof, many of every ship fell sick, and began to die apace. But the speedy passage into our country was a remedy to the crazed, and a preservative for those that were not touched."

This shows, abundantly, how little the sea's saltness was capable of preserving it from putrefaction: but to put the matter beyond all doubt, Mr. Boyle* kept a quantity of sea-water, taken up in the English Channel, for some time barrelled up; and, in the space of a few weeks, it began to acquire a fetid smell: he was also assured by one of his acquaintance, who was becalmed for twelve or fourteen days in the Indian Sea, that the water, for want of motion, began to stink; and that had it continued much longer, the stench would probably have poisoned him. It is the motion, therefore, and not the saltness of the sea, that preserves it in its present state of salubrity; and this, very probably, by dashing and breaking in pieces the rudiments, if I may so call them, of the various animals that would otherwise breed there, and putrefy.

There are some advantages, however, which are derived from the saltness of the sea. Its waters being evaporated, furnish that salt which is used for domestic purposes; and although in some places it is made from springs, and in others dug out of mines, yet the greatest quantity is made only from the sea. That which is called *bay-salt*, (from its coming to us by the bay of Biscay) is a stronger kind, made by evaporation in the sun; that called *common-salt*, is evaporated in pans over the fire, and is of a much inferior quality to the former.

Another benefit arising from the quantity of salt dissolved in the sea, is, that it thus becomes heavier, and, consequently, more buoyant. Mr. Boyle, who examined the difference between sea-water and fresh, found that the former appeared to be about a forty-fifth part heavier than the latter. Those, also, who have had opportunities of bathing in the sea, pretend to have experienced a much greater ease in swimming there than in fresh water. However, as we see they have only a forty-fifth part more of their weight sustained by it, I am apt to doubt whether so minute a difference can be practically perceivable. Be this as it may, as sea-water alters in its weight from fresh, so it is found also to differ from itself in different parts of the ocean. In general, it is perceivable to be heavier, and consequently salter, the nearer we approach the line.[*]

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* Boyle, vol. iii. p. 222

But there is an advantage arising from the saltness of the waters of the sea, much greater than what has been yet mentioned; which is, that their congelation is thus retarded. Some, indeed, have gone so far as to say, that sea-water never freezes:[†] but this is an assertion contradicted by experience. However, it is certain that it requires a much greater degree of cold to freeze it than fresh-water; so that, while rivers and springs are seen converted into one solid body of ice, the sea is always fit for navigation, and no way affected by the coldness of the severest winter. It is, therefore, one of the greatest blessings we derive from this element, that, when at land all the stores of nature are locked up from us, we find the sea ever open to our necessities, and patient of the hand of industry.

But it must not be supposed, because in our temperate climate we never see the sea frozen, that it is in the same manner open in every part of it. A very little acquaintance with the accounts of mariners, must have informed us, that at the polar regions it is embarrassed with mountains and moving sheets of ice, that often render it impassable. These tremendous floats are of different magnitudes; sometimes rising more than a thousand feet above the surface of the water:[‡] sometimes diffused into plains of above two hundred leagues in length; and, in many parts, sixty or eighty broad. They are usually divided by fissures; one piece following another so close, that a person may step from one to the other. Sometimes mountains are seen rising amidst these plains, and presenting the appearance of a variegated landscape, with hills and valleys, houses, churches, and towers. These are appearances in which all naturalists are agreed; but the great contest is respecting their formation. Mr. Buffon asserts,[§] that they are formed from fresh-water alone, which congealing at the mouths of great rivers, accumulate those huge masses that disturb navigation. However, this great naturalist seems not to have been aware that there are two sorts of ice floating in these seas; the flat ice, and the mountain ice: the one formed of sea-water only; the other of fresh.[||]

The flat or driving ice, is entirely composed of sea-water; which, upon dissolution, is found to be salt; and is readily distinguished from the mountain, or fresh-water ice, by its whiteness, and want of transparency. This ice is much more terrible to mariners than that which rises up in lumps: a ship can avoid the one, as it is seen at a distance; but it often gets in among the other, which, sometimes closing, crushes it to pieces. This, which manifestly has a different origin from the fresh-water ice, may perhaps have been produced in the Icy Sea, beneath the pole; or along the coasts of Spitzbergen or Nova Zembla.

The mountain ice, as was said, is different in every respect, being formed of fresh-water, and appearing hard and transparent; it is generally of a pale green colour, though some pieces are of a beautiful sky-blue; many large masses also appear gray, and some black

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[*] Phil. Trans. vol. ii. p. 297.

[†] Macrobius.

[‡] Crantz's History of Greenland, vol. 1 p. 31

Buffon, vol. ii. p. 91.

[||] Crantz.

If examined more nearly, they are found to be incorporated with earth, stones, and brush-wood, washed from the shore. On these also are sometimes found, not only earth, but nests with birds' eggs, at several hundred miles from land. The generality of these, though almost totally fresh, have nevertheless a thick crust of salt-water frozen upon them, probably from the power that ice has sometimes to produce ice. Such mountains as are here described, are most usually seen at spring-time, and after a violent storm, driving out to sea, where they at first terrify the mariner, and are soon after dashed to pieces by the continual washing of the waves; or driven into the warmer regions of the south, there to be melted away. They sometimes, however, strike back upon their native shores, where they seem to take root at the feet of mountains; and, as Martius tells us, are sometimes higher than the mountains themselves. Those seen by him were blue, full of clefts and cavities made by the rain, and crowned with snow, which, alternately thawing and freezing every year, augmented their size. These, composed of materials more solid than that driving at sea, presented a variety of agreeable figures to the eye, that with a little help from fancy assumed the appearance of trees in blossom; the inside of churches, with arches, pillars, and windows; and the blue-coloured rays, darting from within, presented the resemblance of a glory.

If we inquire into the origin and formation of these, which, as we see, are very different from the former, I think we have a very satisfactory account of them in Crantz's History of Greenland; and I will take leave to give the passage with a very few alterations. "These mountains of ice," says he, "are not salt, like the sea-water, but sweet; and therefore, can be formed no where except on the mountains, in rivers, in caverns, and against the hills near the sea-shore. The mountains of Greenland are so high, that the snow which falls upon them, particularly on the north-side, is in one night's time wholly converted into ice: they also contain clefts and cavities, where the sun seldom or never injects his rays: besides these, are projections, or landing-places, on the declivities of the steepest hills, where the rain and snow-water lodge, and quickly congeal. When now the accumulated flakes of snow slide down, or fall with the rain from the eminences above, on these prominences; or, when here and there a mountain-spring comes rolling down to such a lodging-place, where the ice has already seated itself, they all freeze, and add their tribute to it. This, by degrees, waxes to a body of ice, that can no more be overpowered by the sun; and which, though it may indeed, at certain seasons, diminish by a thaw, yet, upon the whole, through annual acquisitions, it assumes an annual growth. Such a body of ice is often prominent far over the rocks. It does not melt on the upper surface, but underneath; and often cracks into many larger or smaller clefts, from whence the thawed water trickles out. By this, it becomes at last so weak, that being overloaded with its own ponderous bulk, it breaks loose, and tumbles down the rocks with a terrible crash. Where it happens to overhang a precipice on the shore, it plunges into the deep with a shock like thunder; and with such an agitation of the water, as will overset a boat at some distance, as many a poor Greenlander has fatally experienced." Thus are these amazing ice-mountains launched forth to sea, and found floating in the waters round both the poles. It is these that have hindered mariners from discovering the extensive countries that lie round the South Pole; and that probably block up the passage to China by the North.

I will conclude this chapter, with one effect more, produced by the saltness of the sea; which is the luminous appearance of its waves in the night. All who have been spectators of a sea by night, a little ruffled with winds, seldom fail of observing its fiery brightness. In some places it shines as far as the eye can reach;* at other times, only when the waves boom against the side of the vessel, or the oar dashes into the water. Some seas shine often; others more seldom; some, ever when particular winds blow; and others within a narrow compass; a long tract of light being seen along the surface, whilst all the rest is hid in total darkness. It is not easy to account for these extraordinary appearances: some have supposed that a number of luminous insects produced the effect, and this is in reality sometimes the case; in general, however, they have every resemblance to that light produced by electricity; and, probably, arise from the agitation and dashing of the saline particles of the fluid against each other. But the manner in which this is done, for we can produce nothing similar by any experiments hitherto made, remains for some happier accident to discover. Our progress in the knowledge of nature is slow: and it is a mortifying consideration, that we are hitherto more indebted for success to chance than industry.

CHAPTER XVI.

OF THE TIDES, MOTION, AND CURRENTS OF THE SEA; WITH THEIR EFFECTS.

It was said in the former chapter, that the waters of the sea were kept sweet by their motion; without which they would soon putrefy, and spread universal infection. If we look for final causes, here indeed we have a great and an obvious one that presents itself before us. Had the sea been made without motion, and resembling a pool of stagnant water, the nobler races of animated nature would shortly be at an end. Nothing would then be left alive but swarms of ill-formed creatures, with scarcely more than vegetable life; and subsisting by putrefaction. Were this extensive bed of waters entirely quiescent, millions of the smaller reptile kinds would there find a proper retreat to breed and multiply in: they would find there no agitation, no concussion in the parts of the fluid to crush their feeble frames, or to force them from the places where they were bred: there they would multiply in security and ease, enjoy a short life, and putrefying thus again, give nourishment to numberless others, as little worthy of existence as themselves. But the motion of this great element, effectu ally destroys the number of these viler creatures; its currents and its tides produce continual agitations, the shock of which they are not able to endure; the parts of the fluid rubbing against each other, destroy all the viscidities; and the ocean, if I may so express it, acquires health by exercise.

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* Boyle, vol. i. p. 294.

The most obvious motion of the sea, and the most generally acknowledged, is that of its tides. This element is observed to flow for certain hours, from south towards the north; in which motion or flux, which lasts about six hours, the sea gradually swells; so that entering the mouths of rivers, it drives back the river-waters to their heads. After a continual flux of six hours, the sea seems to rest for a quarter of an hour; and then begins to ebb, or retire back again, from north to south, for six hours more; in which time the waters sinking, the rivers resume their natural course. After a seeming pause of a quarter of an hour, the sea again begins to flow as before: and thus it has alternately risen and fallen, twice a-day, since the creation.

This amazing appearance did not fail to excite the curiosity, as it did the wonder of the ancients. After some wild conjectures of the earliest philosophers, it became well known in the time of Pliny, that the tides were entirely under the influence, in a small degree, of the sun; but in a much greater of the moon. It was found that there was a flux and reflux of the sea, in the space of twelve hours, fifty minutes, which is exactly the time of a lunar day. It was observed, that whenever the moon was in the meridian, or, in other words, as nearly as possible over any part of the sea, that the sea flowed to that part, and made a tide there; on the contrary, it was found, that when the moon left the meridian, the sea began to flow back again from whence it came; and there might be said to ebb. Thus far the waters of the sea seemed very regularly to attend the motions of the moon. But as it appeared, likewise, that when the moon was in the opposite meridian, as far off on the other side of the globe, that there was a tide on this side also; so that the moon produced two tides, one by her greatest approach to us, and another by her greatest distance from us: in other words, the moon, in once going round the earth, produced two tides, always at the same time; one on the other part of the globe directly under her; and the other, on the part of the globe directly opposite.

Mankind continued for several ages content with knowing the general cause of these wonders, hopeless of discovering the particular manner of the moon's operation. Kepler was the first who conjectured that attraction was the principal cause, asserting, that the sphere of the moon's operation extended to the earth, and drew up its waters. The precise manner in which this is done, was discovered by Newton.

The moon has been found, like all the rest of the planets, to attract and to be attracted by the earth. This attraction prevails throughout our whole planetary system. The more matter there is contained in any body, the more it attracts; and its influence decreases in proportion as the distance, when squared, increases. This being premised, let us see what must ensue upon supposing the moon in the meridian of any tract of the sea. The surface of the water immediately under the moon, is nearer the moon than any other part of the globe is; and, therefore, must be more subject to its attraction than the waters any where else. The waters will, therefore, be attracted by the moon, and rise in a heap; whose eminence will be the highest where the attraction is greatest. In order to form this eminence, it is obvious that the surface, as well as the depths, will be agitated; and that wherever the waters run from one part, succeeding waters must run to fill up the space it has left. Thus the waters of the sea, running from all parts, to attend the motion of the moon, produce the flowing of the tide; and it is high tide at that part wherever the moon comes over it, or to its meridian.

But when the moon travels onward, and ceases to point over the place where the waters were just risen, the cause here of their rising ceasing to operate, they will flow back by their natural gravity into the lower parts from whence they had travelled; and this retiring of the waters will form the ebbing of the sea.

Thus the first part of the demonstration is obvious; since, in general, it requires no great sagacity to conceive that the waters nearest the moon are most attracted, or raised highest by the moon. But the other part of the demonstration, namely, how there come to be high tides at the same time, on the opposite side of the globe, and where the waters are farthest from the moon, is not so easy to conceive. To comprehend this, it must be observed, that the part of the earth and its waters that are farthest from the moon, are the parts of all others that are least attracted by the moon: it must also be observed, that all the waters, when the moon is on the opposite side of the earth, must be attracted by it in the same direction that the earth itself attracts them; that is, if I may so say, quite through the body of the earth, towards the moon itself. This, therefore, being conceived, it is plain that those waters which are farthest from the moon, will have less weight than those of any other part, on the same side of the globe; because the moon's attraction, which conspires with the earth's attraction, is there least. Now, therefore, the waters farthest from the moon, having less weight, and being lightest, will be pressed on all sides, by those that, having more attraction, are heavier: they will be pressed, I say, on all sides; and the heavier waters flowing in, will make them swell and rise, in an eminence directly opposite to that on the other side of the globe, caused by the more immediate influence of the moon.

In this manner, the moon, in one diurnal revolution, produces two tides; one raised immediately under the sphere of its influence, and the other directly opposite to it. As the moon travels, this vast body of waters rears upward, as if to watch its motions; and pursues the same constant rotation. However, in this great work of raising the tides, the sun has no small share; it produces its own tides constantly every day, just as the moon does, but in a much less degree, because the sun is at an immensely greater distance. Thus there are solar tides, and lunar tides. When the forces of these two great luminaries concur, which they always do when they are either in the same, or in opposite parts of the heavens, they jointly produce a much greater tide, than when they are so situated in the heavens, as each to make peculiar tides of their own. To express the very same thing technically; in the conjunctions and oppositions of the sun and moon, the attraction of the sun conspires with the attraction of the moon; by which means the high spring-tides are formed. But in the quadratures of the sun and moon, the water raised by the one is depressed by the other; and hence the lower neap-tides have their production. In a word, the tides are greatest in the syzigies, and least in the quadratures.

This theory well understood, and the astronomical terms previously known, it may readily be brought to explain the various appearances of the tides, if the earth were covered with a deep sea, and the waters uninfluenced by shoals, currents, straits, or tempests. But in every part of the sea, near the shores, the geographer must come in to correct the calculations of the astronomer. For, by reason of the shallowness of some places, and the narrowness of the straits in others, there arises a great diversity in the effect, not to be accounted for without an exact knowledge of all the circumstances of the place. In the great depths of the ocean, for instance, a very slow and imperceptible motion of the whole body of water will suffice to raise its surface several feet high; but if the same increase of water is to be conveyed through a narrow channel, it must rush through it with the most impetuous rapidity. Thus, in the English Channel, and the German Ocean, the tide is found to flow strongest in those places that are narrowest; the same quantity of water being, in this case, driven through a smaller passage. It is often seen, therefore, pouring through a strait with great force; and by its rapidity, considerably raised above the surface of that part of the ocean into which it runs.

This shallowness and narrowness in many parts of the sea give also rise to a peculiarity in the tides of some parts of the world. For in many places, and in our own seas in particular, the greatest swell of the tide is not while the moon is in its meridian height, and directly over the place, but some time after it has declined from thence. The sea, in this case, being obstructed, pursues the moon with what dispatch it can, but does not arrive with all its waters till long after the moon has ceased to operate. Lastly, from this shallowness of the sea, and from its being obstructed by shoals and straits, we may account for the Mediterranean, the Baltic, and the Black Sea, having no sensible tides. These, though to us they seem very extensive, are not however large enough to be affected by the influence of the moon; and as to their communication with the ocean, through such narrow inlets it is impossible in a few hour's time that they should receive and return water enough to raise or depress them in any considerable degree.

In general, therefore, we may observe, that all tides are much higher, and more considerable, in the torrid zone, than in the rest of the ocean; the sea in those parts being generally deeper, and less affected by changeable winds, or winding shores.* The greatest tide we know of, is that at the mouth of the river Indus, where the water rises thirty feet in height. How great, therefore, must have been the amazement of Alexander's soldiers at so strange an appearance! They who always before had been accustomed only to the scarcely perceptible risings of the Mediterranean, or the minute intumescence of the Black Sea, when made at once spectators of a river rising and falling thirty feet in a few hours, must, no doubt, have felt the most extreme awe, and, as we are told,* a mixture of curiosity and apprehension. The tides are also remarkably high on the coasts of Malay, in the straits of Sunda, in the Red Sea, at the mouth of the river St. Lawrence, along the coasts of China and Japan, at Panama, and in the gulf of Bengal. The tides at Tonquin, however, are the most remarkable in the world. In this part there is but one tide, and one ebb, in twenty-four hours; whereas, as we have said before, in other places there are two. Besides, there, twice in each month, there is no tide at all, when the moon is near the equinoctial, the water being for some time quite stagnant. These, with some other odd appearances attending the same phænomena, were considered by many as inscrutable; but Sir Isaac Newton, with peculiar sagacity, adjudged them to arise from the concurrence of two tides, one from the South Sea, and the other from the Indian Ocean. Of each of these tides there come successively two every day; two at one time greater, and two at another that are less. The time between the arrival of the two greater, is considered by him as high tide; the time between the two lesser, as ebb. In short, with this clue, that great mathematician solved every appearance, and so established his theory as to silence every opposer

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* Buffon, vol. ii. p. 187.

This fluctuation of the sea from the tides, produces another, and more constant rotation of its waters, from the east to the west, in this respect following the course of the moon. This may be considered as one great and general current of the waters of the sea; and although it be not every where distinguishable, it is nevertheless every where existent, except when opposed by some particular current or eddy produced by partial and local causes. This tendency of the sea towards the west, is plainly perceivable in all the great straits of the ocean; as, for instance, in those of Magellan, where the tide running in from the east, rises twenty feet high, and continues flowing six hours; whereas the ebb continues but two hours, and the current is directed to the west. This proves that the flux is not equal to the reflux; and that from both results a motion of the sea westward, which is more powerful during the time of the flux than the reflux.

But this motion westward has been sensibly observed by navigators, in their passage back from India to Madagascar, and so on to Africa. In the great Pacific Ocean also it is very perceivable; but the places where it is most obvious, are, as was said, in those straits which join one ocean to another. In the straits between the Maldivia islands, in the gulf of Mexico, between Cuba and Jucatan. In the straits of the gulf of Paria, the motion is so violent, that it hath received the appellation of the Dragon's Mouth. Northward, in the sea of Canada, in Waigat's straits, in the straits of Java, and in short, in every strait where the ocean on one part pours into the ocean on the other. In this manner, therefore, is the sea carried with an unceasing circulation round the globe; and, at the same time that its waters are pushed back and forward with the tide, they have thus a progressive current to the west, which though less observable, is not the less real.

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* Quintus Curtius.

Besides these two general motions of the sea, there are others which are particular to many parts of it, and are called *currents*. These are found to run in all directions, east, west, north, and south; being formed, as was said above, by various causes; the prominence of the shores, the narrowness of the straits, the variation of the wind, and the inequalities at the bottom. These, though no great object to the philosopher, as their causes are generally local and obvious, are nevertheless of the most material consequence to the mariner; and, without a knowledge of which, he could never succeed. It often has happened, that when a ship has unknowingly got into one of these, every thing seems to go forward with success, the mariners suppose themselves every hour approaching their wished-for port, the wind fills their sails, and the ship's prow seems to divide the water; but, at last, by miserable experience they find, that instead of going forward, they have been all the time receding. The business of currents, therefore, makes a considerable article in navigation; and the direction of their stream, and their rapidity, has been carefully set down. This some do by the observation of the surface of the current; or by the driving of the froth along the shore; or by throwing out what is called the *log-line*, with a buoy made for that purpose, and by the direction and motion of this, they judge of the setting and the rapidity of the current.

These currents are generally found to be most violent under the equator, where indeed all the motions of the ocean are most perceivable. Along the coasts of Guinea, if a ship happens to overshoot the mouth of any river it is bound to, the current prevents its return; so that it is obliged to steer out to sea, and take a very large compass, in order to correct the former mistake. These set in a contrary direction to the general motion of the sea westward; and that so strongly, that a passage which, with the current, is made in two days, is with difficulty performed in six weeks against it. However, they do not extend above twenty leagues from the coast; and ships going to the East Indies, take care not to come within the sphere of their action. At Sumatra, the currents, which are extremely rapid, run from south to north: there are also strong currents between Madagascar and the Cape of Good Hope. On the western coasts of America, the current always runs from the south to the north, where a south wind, continually blowing, most probably occasions this phænomenon. But the currents that are most remarkable, are those continually flowing in the Mediterranean sea, both from the ocean by the straits of Gibraltar, and at its other extremity, from the Euxine sea by the Archipelago. This is one of the most extraordinary appearances in nature; this large sea receiving not only the numerous rivers that fall into it, such as the Nile, the Rhone, and the Po, but also a very great influx from the Euxine sea on one part, and the ocean on the other. At the same time, it is seen to return none of those waters it is thus known to receive. Outlets running from it there are none; no rivers but such as bring it fresh supplies; no straits but what are constantly pouring their waters into it: it has, therefore, been the wonder of mankind in every age, how, and by what means, this vast concourse of waters are disposed of; or how this sea, which is always receiving, and never returning, is no way fuller than before. In order to account for this, some have said, that the water was reconveyed by subterraneous passages into the Red Sea.* There is a story told of an Arabian califf, who caught a dolphin in this sea, admiring the beauty of which, he let it go again, having previously marked it by a ring of iron. Some time after a dolphin was caught in the Red Sea, and quickly known by the ring to be the same that had been taken in the Mediterranean before. Such, however, as have not been willing to found their opinions upon a story, have attempted to account for the disposal of the waters of the Mediterranean by evaporation. For this purpose they have entered into long calculations upon the extent of its surface, and the quantity of water that would be raised from such a surface in a year. They then compute how much water runs in by its rivers and straits in that time; and find, that the quantity exhausted by evaporation, greatly exceeds the quantity supplied by rivers and seas. This solution, no doubt, would be satisfactory, did not the ocean, and the Euxine, evaporate as well as the Mediterranean: and as these are subject to the same drain, it must follow, that all the seas will in this respect be upon a par; and, therefore, there must be some other cause for this unperceived drain, and continual supply This seems to be satisfactorily enough accounted for by Dr. Smith, who supposes an under current running through the straits of Gibraltar to carry out as much water into the ocean, as the upper current continually carries in from it. To confirm this, he observes, that nearer home, between the north and the south foreland, the tide is known to run one way at top, and the ebb another way at bottom. This double current he also confirms by an experiment communicated to him by an able seaman, who being with one of the king's frigates in the Baltic, found he went with his boat into the mid-stream, and was carried violently by the current; upon which a basket was sunk, with a large cannon-ball, to a certain depth of water, which gave a check to the boat's motion; as the basket sunk still lower, the boat was driven, by the force of the water below, against the upper current; and the lower the basket was let down, the stronger the under current was found, and the quicker was the boat's motion against the upper stream, which seemed not to be above four fathom deep. From hence we readily infer, that the same cause may operate at the straits of Gibraltar; and that while the Mediterranean seems replenishing at top, it may be emptying at bottom.

The number of the currents at sea are impossible to be recounted, nor indeed are they always known; new ones are daily produced by a variety of causes, and as quickly disappear. When a regular current is opposed by another in a narrow strait, or where the bottom of the sea is very uneven, a whirlpool is often formed. These were formerly considered as the most formidable obstructions to navigation; and the ancient poets and historians speak of them with terror; they are described as swallowing up ships, and dashing them against the rocks at the bottom: apprehension did not fail to add imaginary terrors to the description, and placed at the centre of the whirlpool a dreadful den, fraught with monsters whose howlings served to add new horrors to the dashings of the deep. Mankind at present, however, view these eddies of the sea with very little apprehension; and some have wondered how the ancients could have so much overcharged their descriptions. But all this is very naturally accounted for. In those times when navigation was in its infancy, and the slightest concussion of the waves generally sent the poor adventurer to the bottom, it is not to be wondered at that he was terrified at the violent agitations in one of these. When his little ship, but ill fitted for opposing the fury of the sea, was got within the vortex, there was then no possibility of ever returning. To add to the fatality, they were always near the shore; and along the shore was the only place where this ill-provided mariner durst venture to sail. These were, therefore, dreadful impediments to his navigation; for if he attempted to pass between them and the shore, he was sometimes sucked in by the eddy; and if he attempted to avoid them out at sea, he was often sunk by the storm. But in our time, and in our present improved state of navigation, Charybdis, and the Euripus, with all the other irregular currents of the Mediterranean, are no longer formidable. Mr. Addison, not attending to this train of thinking, upon passing through the straits of Sicily, was surprised at the little there was of terror in the present appearance of Scylla and Charybdis; and seems to be of opinion, that their agitations are much diminished since the times of antiquity. In fact, from the reasons above, all the wonders of the Mediterranean sea are described in much higher colours than they merit, to us who are acquainted with the more magnificent terrors of the ocean. The Mediterranean is one of the smoothest and most gentle seas in the world: its tides are scarce perceivable, except in the gulf of Venice, and shipwrecks are less known there than in any other part of the world.

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* Kircher Mundt. Subt. vol. i.

It is in the ocean, therefore, that these whirlpools are particularly dangerous, where the tides are violent, and the tempests fierce. To mention only one, that called *the Maelstroom*, upon the coasts of Norway, which is considered as the most dreadful and voracious in the world. The name it has received from the natives, signifies *the navel of the sea;* since they suppose that a great share of the water of the sea is sucked up and discharged by its vortex. A minute description of the internal parts is not to be expected, since none who were there ever returned to bring back information. The body of the waters that form this whirlpool, are extended in a circle above thirteen miles in circumference.* In the midst of this stands a rock, against which the tide in its ebb is dashed with inconceivable fury. At this time it instantly swallows up all things that come within the sphere of its violence, trees, timber, and shipping. No skill in the mariner, nor strength of rowing, can work an escape: the sailor at the helm finds the ship at first go in a current opposite to his intentions; his vessel's motion, though slow in the beginning, becomes every moment more rapid; it goes round in circles still narrower and narrower, till at last it is dashed against the rocks, and instantly disappears: nor is it seen again for six hours; till the tide flowing, it is vomited forth with the same violence with which it was drawn in. The noise of this dreadful vortex still farther contributes to increase its terror, which, with the dashing of the waters, and the dreadful valley, if it may be so called, caused by their circulation, makes one of the most tremendous objects in nature.

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* Kircher, Mund. Subt. vol. i. p. 158.

CHAPTER XVII.

OF THE CHANGES PRODUCED BY THE SEA UPON THE EARTH.

From what has been said, as well of the earth as of the sea, they both appear to be in continual fluctuation. The earth, the common promptuary that supplies subsistence to men, animals, and vegetables, is continually furnishing its stores to their support. But the matter which is thus derived from it, is soon restored and laid down again to be prepared for fresh mutations. The transmigration of souls is, no doubt, false and whimsical; but nothing can be more certain than the transmigration of bodies: the spoils of the meanest reptile may go to the formation of a prince; and, on the contrary, as the poet has it, the body of Cæsar may be employed in stopping a beer-barrel. From this, and other causes, therefore, the earth is in continual change. Its internal fires, the deviation of its rivers, and the falling of its mountains, are daily altering its surface; and geography can scarce recollect the lakes and the valleys that history once described.

But these changes are nothing to the instability of the ocean. It would seem that inquietude was as natural to it as its fluidity. It is first seen with a constant and equable motion going towards the west; the tides then interrupt this progression, and for a time drive the waters in a contrary direction; besides these agitations, the currents act their part in a smaller sphere, being generally greatest where the other motions of the sea are least; namely, nearest the shore: the winds also contribute their share in this universal fluctuation; so that scarcely any part of the sea is wholly seen to stagnate.

> Nil enim quiescit, undis impellitur unda,
> Et spiritus et calor toto se corpore miscent.

As this great element is thus changed, and continually labouring internally, it may be readily supposed that it produces correspondent changes upon its shores, and those parts of the earth subject to its influence. In fact it is every day making considerable alterations, either by overflowing its shores in one place, or deserting them in others; by covering over whole tracts of country that were cultivated and peopled, at one time; or by leaving its bed to be appropriated to the purposes of vegetation, and to supply a new theatre for human industry, at another.

In this struggle between the earth and the sea for dominion, the greatest number of our shores seem to defy the whole rage of the waves, both by their height, and the rocky materials of which they are composed. The coasts of Italy, for instance,* are bordered with rocks of marble of different kinds, the quarries of which may easily be distinguished at a distance from sea, and appear like perpendicular columns of the most beautiful kinds of marble, ranged along the shore. In general, the coasts of France, from Brest to Bourdeaux, are composed of rocks; as are also those of Spain and England, which defend the land, and only are interrupted, here and there, to give an egress to rivers, and to grant the conveniences of bays and harbours to our shipping. It may in general be remarked, that wherever the sea is most violent and furious, there the boldest shores, and of the most compact materials, are found to oppose it There are many shores several hundred feet perpendicular, against which the sea, when swollen with tides or storms, rises and beats with inconceivable fury. In the Orkneys,† where the shores are thus formed, it sometimes, when agitated by a storm, rises two hundred feet perpendicular, and dashes up its spray, together with sand and other substances that compose its bottom, upon land, like showers of rain.

From hence, therefore, we may conceive how the violence of the sea, and the boldness of the shore, may be said to have made each other. Where the sea meets no obstacles, it spreads its waters with a gentle intumescence, till all its power is destroyed, by wanting depth to aid the motion. But when its progress is checked in the midst, by the prominence of rocks, or the abrupt elevation of the land, it dashes with all the force of its depth against the obstacle, and forms, by its repeated violence, that abruptness of the shore which confines its impetuosity. Where the sea is extremely deep, or very much vexed by tempests, it is no small obstacle that can confine its rage; and for this reason we see the boldest shores projected against the deepest waters; all less impediments having long before been surmounted and washed away. Perhaps of all the shores in the world, there is not one so high as that on the west of St. Kilda, which, upon a late admeasurement,‡ was found to be six hundred fathoms perpendicular above the surface of the sea. Here also, the sea is deep, turbulent, and stormy; so that it requires great force in the shore to oppose its violence. In many parts of the world, and particularly upon the coasts of the East Indies, the shores, though not high above water, are generally very deep, and consequently the waves roll against the land with great weight and irregularity. The rising of the waves against the shore, is called by mariners *the surf of the sea;* and in shipwrecks is generally fatal to such as attempt to swim on shore. In this case no dexterity in the swimmer, no float he can use, neither swimming-girdle nor cork-jacket will save him; the weight of the superincumbent waves breaks upon him at once, and crushes him with certain ruin. Some few of the natives, however, have the art of swimming and of navigating their little boats near those shores where a European is sure of instant destruction.

In places where the force of the sea is less violent, or its tides less rapid, the shores are generally seen to descend with a more gradual declivity. Over these, the waters of the tide steal by almost imper ceptible degrees, covering them for a large extent, and leaving them bare on its recess. Upon these shores, as was said, the sea seldom beats with any great violence, as a large wave has not depth sufficient to float it onwards, so that here only are to be seen gentle surges making calmly towards land, and lessening as they approach. As the sea, in the former description, is generally seen to present prospects of tumult and uproar, here it more usually exhibits a scene of repose and tranquil beauty. Its waters which, when surveyed from the precipice, afforded a muddy greenish hue, arising from their depth and position to the eye*, when regarded from a shelving shore wear the colour of the sky, and seem rising to meet it. The deafening noise of the deep sea, is here converted into gentle murmurs; instead of the water dashing against the face of the rock, it advances and recedes, still going forward, but with just force enough to push its weeds and shells, by insensible approaches, to the shore.

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* Buffon, vol. ii. p. 199. † Ibid. vol. ii. p. 191. ‡ Description of St. Kilda

There are other shores, besides those already described, which either have been raised by art, to oppose the sea's approaches, or, from the sea's gaining ground, are threatened with imminent destruction. The sea's being thus seen to give and take away lands at pleasure, is, without question, one of the most extraordinary considerations in all natural history. In some places it is seen to obtain the superiority by slow and certain approaches; or to burst in at once, and overwhelm all things in undistinguished destruction; in other places it departs from its shores, and where its waters have been known to rage, it leaves fields covered with the most beautiful verdure.

The formation of new lands by the sea's continually bringing its sediment to one place, and by the accumulation of its sands in another, is easily conceived. We have had many instances of this in England. The island of Oxney, which is adjacent to Romney-marsh, was produced in this manner. This had for a long time been a low level, continually in danger of being overflown by the river Rother; but the sea, by its depositions, has gradually raised the bottom of the river, while it has hollowed the mouth; so that the one is sufficiently secured from inundations, and the other is deep enough to admit ships of considerable burthen. The like also may be seen at that bank called the *Doggersands*, where two tides meet, and which thus receives new increase every day, so that in time the place seems to promise fair for being habitable earth. On many parts of the coasts of France, England, Holland, Germany, and Prussia, the sea has been sensibly known to retire.† Hubert Thomas asserts, in his Description of the Country of Liege, that the sea formerly encompassed the city of Tongres, which, however, is at present thirty-five leagues distant from it. this assertion he supports by many strong reasons; and among others, by the iron rings fixed in the walls of the town, for fastening the ships that came into the port. In Italy there is a considerable piece of ground gained at the mouth of the river Arno; and Ravenna, that once stood by the sea-side, is now considerably removed from it. But we need scarce mention these, when we find that the whole republic of Holland seems to be a conquest upon the sea, and, in a manner, rescued from its bosom. The surface of the earth, in this country, is below the level of the bed of the sea; and I remember, upon approaching the coast, to have looked down upon it from the sea, as into a valley; however, it is every day rising higher by the depositions made upon it by the sea, the Rhine, and the Meuse; and those parts which formerly admitted large men of war, are now known to be too shallow to receive ships of very moderate burthen.* The province of Jucatan, a peninsula in the gulf of Mexico, was formerly a part of the sea. This tract, which stretches out into the ocean a hundred leagues, and which is above thirty broad, is every where, at a moderate depth below the surface, composed of shells, which evince that its land once formed the bed of the sea. In France, the town of Aigues Mortes was a port in the time of St. Louis, which is now removed more than four miles from the sea.—Psalmodi, in the same kingdom, was an island in the year 815, but is now more than six miles from the shore. All along the coasts of Norfolk, I am very well assured, that in the memory of man the sea has gained fifty yards in some places, and lost as much in others.

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* Newton's Optic's, p. 133—167. † Buffon, vol. vi. p. 424

Thus numerous, therefore, are the instances of new lands having been produced from the sea, which, as we see, is brought about two different ways: first, by the waters raising banks of sand and mud where their sediment is deposited; and, secondly, by their relinquishing the shore entirely, and leaving it unoccupied to the industry of man.

But as the sea has been thus known to recede from some lands, so has it, by fatal experience, been found to encroach upon others; and probably these depredations on one part of the shore, may account for their dereliction from another; for the current which rested upon some certain bank, having got an egress in some other place, it no longer presses upon its former bed, but pours all its stream into the new entrance; so that every inundation of the sea may be attended with some correspondent dereliction of another shore.

However this be, we have numerous histories of the sea's inundations, and its burying whole provinces in its bosom. Many countries that have been thus destroyed, bear melancholy witness to the truth of history; and show the tops of their houses, and the spires of their steeples, still standing at the bottom of the water. One of the most considerable inundations we have in history, is that which happened in the reign of Henry I. which overflowed the estates of the Earl Godwin, and forms now that bank called the Goodwin Sands. In the year 1546, a similar eruption of the sea destroyed a hundred thousand persons in the territory of Dort; and yet a greater number round Dullart. In Friezland, and Zealand, there were more than three hundred villages overwhelmed; and their ruins continue still visible at the bottom of the water in a clear day. The Baltic sea has, by slow degrees, covered a large part of Pomerania; and, among others, destroyed and overwhelmed the famous port of Vineta. In the same manner, the Norwegian sea has formed several little islands from the main land, and still daily advances upon the continent. The German sea has advanced upon the shores of Holland, near Catt; so that the ruins of an ancient citadel of the Romans, which was formerly built upon this coast, are now actually under water. To these accidents several more might be added; our own historians, and those of other countries, abound with them; almost every flat shore of any extent, being able to show something that it has lost, or something that it has gained from the sea.

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* Buffon, vol. vi. p. 424.

There are some shores on which the sea has made temporary depredations; where it has overflowed, and after remaining perhaps some ages, it has again retired of its own accord, or been driven back by the industry of man.* There are many lands in Norway, Scotland, and the Maldivia Islands, that are at one time covered with water, and at another free. The country round the isle of Ely, in the time of Bede, about a thousand years ago, was one of the most delightful spots in the whole kingdom; it was not only richly cultivated, and produced all the necessaries of life, but grapes also, that afforded excellent wine. The accounts of that time are copious in the description of its verdure and fertility; its rich pastures covered with flowers and herbage; its beautiful shades, and wholesome air. But the sea, breaking in upon the land, overwhelmed the whole country, took possession of the soil, and totally destroyed one of the most fertile valleys in the world. Its air, from being dry and healthful, from that time became most unwholesome, and clogged with vapours; and the small part of the country that, by being higher than the rest, escaped the deluge, was soon rendered uninhabitable, from its noxious vapours. Thus this country continued under water for some centuries; till at last the sea, by the same caprice which had prompted its invasions, began to abandon the earth in like manner. It has continued for some ages to relinquish its former conquests; and although the inhabitants can neither boast the longevity, nor the luxuries of their former preoccupants, yet they find ample means of subsistence; and if they happen to survive the first years of their residence there, they are often known to arrive at a good old age.

But although history be silent as to many other inundations of the like kind, where the sea has overflowed the country, and afterwards retired, yet we have numberless testimonies of another nature, that prove it beyond the possibility of doubt: I mean those numerous trees that are found buried at considerable depths in places where either rivers or the sea has accidentally overflown.† At the mouth of the river Ness, near Bruges, in Flanders, at the depth of fifty feet, are found great quantities of trees lying as close to each other as they do in a wood: the trunks, the branches, and the leaves, are in such perfect preservation, that the particular kind of each tree may instantly be known. About five hundred years ago, this very ground was known to have been covered with the sea; nor is there any history or tradition of its having been dry ground, which we can have no doubt must have been the case. Thus we see a country flourishing in verdure, producing large forests, and trees of various kinds, overwhelmed by the sea. We see this element depositing its sediment to a height of fifty feet; and its waters must, therefore, have risen much higher. We see the same, after it has thus overwhelmed and sunk the land so deep beneath its slime, capriciously retiring from the same coasts, and leaving that habitable once more, which it had formerly destroyed. All this is wonderful; and perhaps, instead of attempting to inquire after the cause, which has hitherto been inscrutable, it will best become us to rest satisfied with admiration.

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* Buffon, vol. ii. p. 425.

† Ibid, vol. ii. p. 403

At the city of Modena in Italy, and about four miles round it, wherever it is dug, when the workmen arrive at the depth of sixty-three feet, they come to a bed of chalk, which they bore with an auger five feet deep: they then withdraw from the pit, before the auger is removed, and upon its extraction, the water bursts up through the aperture with great violence, and quickly fills this new-made well, which continues full, and is affected neither by rains nor droughts. But that which is most remarkable in this operation, is the layers of earth as we descend. At the depth of fourteen feet are found the ruins of an ancient city, paved streets, houses, floors, and different pieces of Mosaic. Under this is found a solid earth, that would induce one to think had never been removed; however, under it is found a soft oozy earth, made up of vegetables; and at twenty-six feet depth, large trees entire, such as walnut-trees, with the walnuts still sticking on the stem, and their leaves and branches in exact preservation. At twenty-eight feet deep, a soft chalk is found, mixed with a vast quantity of shells; and this bed is eleven feet thick. Under this, vegetables are found again, with leaves, and branches of trees as before; and thus alternately chalk and vegetable earth to the depth of sixty-three feet. These are the layers wherever the workmen attempt to bore; while in many of them they also find pieces of charcoal, bones, and bits of iron. From this description, therefore, it appears, that this country has been alternately overflowed and deserted by the sea, one age after another: nor were these overflowings and retirings of trifling depth, or of short continuance. When the sea burst in, it must have been a long time in overwhelming the branches of the fallen forest with its sediment; and still longer in forming a regular bed of shells eleven feet over them. It must have, therefore, taken an age, at least, to make any one of these layers; and we may conclude, that it must have been many ages employed in the production of them all. The land also, upon being deserted, must have had time to grow compact, to gather fresh fertility, and to be drained of its waters before it could be disposed to vegetation, or before its trees could have shot forth again to maturity.

We have instances nearer home of the same kind given us in the Philosophical Transactions; one of them by Mr. Derham. An inundation of the sea, at Dagenham, in Essex, laying bare a part of the adjacent pasture for about two hundred feet wide, and, in some places, twenty deep, it discovered a number of trees that had lain there for many ages before; these trees, by laying long under ground, were become black and hard, and their fibres so tough, that one might as easily break a wire, as any of them: they lay so thick in the place where they were found, that in many parts he could step from one to another: he conceived also, that not only all the adjacent marshes, for several hundred acres, were covered underneath with such timber, but also the marshes along the mouth of the Thames, for several miles. The meeting with these trees at such depths, he ascribes to the sediment of the river, and the tides, which constantly washing over them, have always left some part of their substance behind, so as, by repeated alluvions, to work a bed of vegetable earth over them, to the height at which he found it.

The levels of Hatfield-Chace, in Yorkshire, a tract above eighteen thousand acres, which was yearly overflown, was reduced to arable and pasture-land, by one sir Cornelius Vermusden, a Dutchman. At the bottom of this wide extent, are found millions of the roots and bodies of trees, of such as this island either formerly did, or does at present produce. The roots of all stand in their proper postures; and by them, as thick as ever they could grow, the respective trunks of each, some above thirty yards long. The oaks, some of which have been sold for fifteen pounds a piece, are as black as ebony, very lasting, and close grained. The ash-trees are as soft as earth, and are commonly cut in pieces by the workmen's spades, and as soon as flung up into the open air, turn to dust. But all the rest, even the willows themselves, which are softer than the ash, preserve their substance and texture to this very day. Some of the firs appear to have vegetated, even after they were fallen, and to have, from their branches, struck up large trees, as great as the parent trunk. It is observable, that many of these trees have been burnt, some quite through, some on one side, some have been found chopped and squared, others riven with great wooden wedges, all sufficiently manifesting, that the country which was deluged had formerly been inhabited. Near a great root of one tree, were found eight coins of the Roman emperors; and, in some places, the marks of the ridge and furrow were plainly perceivable, which testified that the ground had formerly been patient of cultivation.

The learned naturalist who has given this description,* has pretty plainly evinced, that this forest, in particular, must have been thus levelled by the Romans; and that the falling of the trees must have contributed to the accumulation of the waters. "The Romans," says he, "when the Britons fled, always pursued them into the fortresses of low woods, and miry forests: in these the wild natives found shelter; and, when opportunity offered, issued out, and fell upon their invaders without mercy. In this manner the Romans were at length so harassed, that orders were issued out for cutting down all the woods and forests in Britain. In order to effect this, and destroy the enemy the easier, they set fire to the woods, composed of pines, and other inflammable timber, which spreading, the conflagration destroyed not only the forest, but infinite numbers of the wretched inhabitants who had taken shelter therein. When the pine-trees had thus done what mischief they could, the Romans then brought their army nearer, and, with whole legions of the captive Britons, cut down most of the trees that were yet left standing; leaving only here and there some trees untouched, as monuments of their fury. These, unneedful of their labour, being destitute of the support of the underwood, and of their neighbouring trees, were easily overthrown by the winds, and, without interruption, remained on the places where they happened to fall. The forest, thus fallen, must necessarily have stopped up the currents, both from land and sea; and turned into great lakes, what were before but temporary streams. The working of the waters here, the consumption and decay of rotten boughs and branches, and the vast increase of water-moss which flourishes upon marshy grounds, soon formed a covering over the trunks of the fallen trees, and raised the earth several feet above its former level. The earth thus every day swelling, by a continual increase from the sediment of the waters, and by the lightness of the vegetable substances of which it was composed, soon overtopt the waters by which this intumescence was at first effected; so that it entirely got rid of its inundations, or only demanded a slight assistance from man for that purpose." This may be the origin of all bogs, which are performed by the putrefaction of vegetable substances, mixed with the mud and slime deposited by waters, and at length acquiring a sufficient consistency.

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* Phil. Trans. vol. iv. part ii. p. 214.

From this we see what powerful effects the sea is capable of producing upon its shores, either by overflowing some, or deserting others; by altering the direction of these, and rendering those craggy and precipitate, which before were shelving. But the influence it has upon these, is nothing to that which it has upon that great body of earth, which forms its bottom. It is at the bottom of the sea that the greatest wonders are performed, and the most rapid changes are produced; it is there that the motion of the tides and the currents have their whole force, and agitate the substances of which their bed is composed. But all these are almost wholly hid from human curiosity; the miracles of the deep are performed in secret; and we have but little information from its abysses, except what we receive by inspection at very shallow depths, or by the plummet, or from divers, who are kown to descend from twenty to thirty fathoms.*

The eye can reach but a very short way into the depths of the sea; and that only when its surface is glassy and serene. In many seas it perceives nothing but a bright sandy plain at bottom, extending for several hundred miles, without an intervening object. But in others, particularly in the Red Sea, it is very different: the whole bottom of this extensive bed of waters is, literally speaking, a forest of submarine plants and corals, formed by insects for their habitation, sometimes branching out to a great extent.—Here are seen the madrepores, the sponges, mosses, sea-mushrooms, and other marine productions, covering every part of the bottom; so that some have even supposed the sea to have taken its name from the colour of its plants below. However, these plants are by no means peculiar to this sea, as they are found in great quantities in the Persian Gulf, along the coast of Africa, and those of Provence and Catalonia.

The bottom of many parts of the sea, near America, presents a very different, though a very beautiful appearance. This is covered with vegetables, which make it look as green as a meadow, and beneath are seen thousands of turtles, and other sea animals, feeding thereon

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* Phil. Trans. vol. iv. part ii. p. 192.

In order to extend our knowledge of the sea to greater depths, recourse has been had to the plummet; which is generally made of a lump of lead of about forty pounds weight, fastened to a cord.* This, however, only answers in moderate depths; for when a deep sea is to be sounded, the matter of which the cord is composed, being lighter than the water, floats upon it, and when let down to a considerable depth, its length so increases its surface, that it is often sufficient to prevent the lead from sinking; so that this may be the reason that some parts of the sea are said to have no bottom.

In general, we learn from the plummet, that the bottom of the sea is tolerably even where it has been examined; and that the farther from the shore, the sea is in general the deeper. Notwithstanding, in the midst of a great and unfathomable ocean, we often find an island raising its head, and singly braving its fury. Such islands may be considered as the mountains of the deep; and, could we for a moment imagine the waters of the ocean removed or dried away, we should probably find the inequalities of its bed resembling those that are found at land. Here extensive plains, there valleys, and, in many places, mountains of amazing height. M. Buache has actually given us a map of that part of its bottom, which lies between Africa and America, taken from the several soundings of mariners: in it we find the same uneven surface that we do upon land, the same eminences, and the same depressions. In such an imaginary prospect, however, there would be this difference, that as the tops of land-mountains appear the most barren and rocky, the tops of sea-mountains would be found the most verdant and fruitful.

The plummet, which thus gives us some idea of the inequalities of the bottom, leaves us totally in the dark as to every other particular; recourse, therefore, has been had to divers: these, either being bred up in this dangerous way of life, and accustomed to remain some time under water without breathing, or assisted by means of a diving-bell, have been able to return some confused and uncertain accounts of the places below. In the great diving-bell improved by Dr. Halley, which was large enough to contain five men, and was supplied with fresh air by buckets, that alternately rose and fell, they descended fifty fathom. In this huge machine, which was let down from the mast of the ship, the doctor himself went down to the bottom, where, when the sea was clear, and especially when the sun shone, he could see perfectly well to write or read, and much more to take up any thing that was underneath: at other times, when the water was troubled and thick, it was as dark as night below, so that he was obliged to keep a candle lighted at the bottom. But there was one thing very remarkable, that the water which from above was usually seen of a green colour, when looked at from below, appeared to him of a very different one, casting a redness upon one of his hands, like that of damask roses:†—a proof of the sea's taking its colour not from any thing floating in it, but from the different reflections of the rays of light. Upon the whole, the accounts we have received from the bottom, by this contrivance, are but few. We learn from it, and from divers in general, that while the surface of the sea may be deformed by tempests, it is usually calm and temperate below;* that some divers, who have gone down when the weather was calm, and came up when it was tempestuous, were surprised at their not perceiving the change at the bottom. This, however, must not be supposed to obtain with regard to the tides, and the currents, as they are seen constantly shifting their bottom; taking their bed with great violence from one place, and depositing it upon another. We are informed, also, by divers, that the sea grows colder in proportion as they descend to the bottom; that as far as the sun's rays pierce, it is influenced by their warmth; but lower, the cold becomes almost intolerable. A person of quality, who had been himself a diver, as Mr. Boyle informs us, declared, that though he seldom descended above three or four fathoms, yet he found it so much colder than near the top, that he could not well endure it; and that being let down in a great diving-bell, although the water could not immediately touch him, he found the air extremely cold upon his first arrival at the bottom.

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* Boyle, vol. ii. p. 5.

† Newton's Optics, p. 56

From divers also we learn, that the sea, in many places, is filled with rocks at bottom; and, that among their clefts, and upon their sides, various substances sprout forward, which are either really vegetables, or the nests of insects, increased to some magnitude. Some of these assume the shape of beautiful flowers; and, though soft when taken up, soon harden, and are kept in the cabinets of the curious.

But of all those divers who have brought us information from the bottom of the deep, the famous Nicola Pesce, whose performances are told us by Kircher, is the most celebrated. I will not so much as pretend to vouch for the veracity of Kircher's account, which he assures us he had from the archives of the kings of Sicily; but it may serve to enliven a heavy chapter. "In the times of Frederic, king of Sicily, there lived a celebrated diver, whose name was Nicholas, and who, from his amazing skill in swimming, and his perseverance under water, was surnamed the *Fish*. This man had, from his infancy, been used to the sea; and earned his scanty subsistence by diving for corals and oysters; which he sold to the villagers on shore. His long acquaintance with the sea, at last, brought it to be almost his natural element. He frequently was known to spend five days in the midst of the waves, without any other provisions than the fish which he caught there, and ate raw. He often swam over from Sicily to Calabria, a tempestuous and dangerous passage, carrying letters from the king. He was frequently known to swim among the gulfs of the Lipari islands, no way apprehensive of danger.

"Some mariners out at sea, one day observed something at some distance from them, which they regarded as a sea-monster; but, upon its approach, it was known to be Nicholas, whom they took into their ship. When they asked him whither he was going in so stormy and rough a sea, and at such a distance from land, he shewed them a packet of letters, which he was carrying to one of the towns of Italy, exactly done up in a leather bag, in such a manner as that they could not be wetted by the sea. He kept them thus company for some time on their voyage, conversing and asking questions; and after eating a hearty meal with them, he took his leave, and, jumping into the sea, pursued his voyage alone.

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* Boyle, vol. iii. p. 242.

"In order to aid these powers of enduring in the deep, Nature seemed to have assisted him in a very extraordinary manner; for the spaces between his fingers and toes were webbed, as in a goose; and his chest became so very capacious, that he could take in, at one inspiration, as much breath as would serve him for a whole day.

"The account of so extraordinary a person did not fail to reach the king himself; who, actuated by the general curiosity, ordered that Nicholas should be brought before him. It was no easy matter to find Nicholas, who generally spent his time in the solitudes of the deep; but, at last, however, after much searching, he was found, and brought before his Majesty. The curiosity of this monarch had been long excited by the accounts he had heard of the bottom of the gulf of Charybdis; he therefore conceived that it would be a proper opportunity to have more certain information; and commanded our poor diver to examine the bottom of this dreadful whirlpool: as an incitement to his obedience, he ordered a golden cup to be flung into it. Nicholas was not insensible of the danger to which he was exposed; dangers best known only to himself; and he therefore presumed to remonstrate; but the hopes of the reward, the desire of pleasing the king, and the pleasure of shewing his skill, at last prevailed. He instantly jumped into the gulf, and was swallowed as instantly up in its bosom. He continued for three quarters of an hour below; during which time the king and his attendants remained upon shore anxious for his fate; but he at last appeared, buffeting upon the surface, holding the cup in triumph in one hand, and making his way good among the waves with the other. It may be supposed he was received with applause, upon his arrival on shore; the cup was made the reward of his adventure; the king ordered him to be taken proper care of; and, as he was somewhat fatigued and debilitated by his labour, after a hearty meal he was put to bed, and permitted to refresh himself by sleeping.

"When his spirits were thus restored, he was again brought to satisfy the king's curiosity with a narrative of the wonders he had seen; and his account was to the following effect:—He would never, he said, have obeyed the king's commands, had he been apprized of half the dangers that were before him. There were four things, he said, that rendered the gulf dreadful, not only to men, but even to the fishes themselves: first, the force of the water bursting up from the bottom, which requires great strength to resist: secondly, the abruptness of the rocks, that on every side threatened destruction; thirdly, the force of the whirlpool, dashing against those rocks; and fourthly, the number and magnitude of the polypous fish, some of which appeared as large as a man, and which, every where sticking against the rocks, projected their fibrous arms to entangle him. Being asked how he was able so readily to find the cup that had been thrown in, he replied, that it happened to be flung by the waves into the cavity of a rock, against which he himself was urged in his descent. This account, however, did not satisfy the king's curiosity: being requested to venture once more into the gulf for further discoveries, he at first refused; but the king, desirous of having the most exact information possible of all things to be found in the gulf, repeated his solicitations; and, to give them still greater weight, produced a larger cup than the former, and added also a purse of gold. Upon these considerations, the unfortunate Pessacola once again plunged into the whirlpool, and was never heard of more."

CHAPTER XVIII.

A SUMMARY ACCOUNT OF THE MECHANICAL PROPERTIES OF AIR.

Having described the earth and the sea, we now ascend into that fluid which surrounds them both; and which, in some measure, supports and supplies all animated nature. As upon viewing the bottom of the ocean from its surface, we see an infinity of animals moving therein, and seeking food; so, were some superior being to regard the earth at a proper distance, he might consider us in the same light: he might, from his superior station, behold a number of busy little beings, immersed in the aerial fluid, that every where surrounds them, and sedulously employed in procuring the means of subsistence. This fluid, though too fine for the gross perception of its inhabitants, might, to his nicer organs of sight, be very visible; and, while he at once saw into its operations, he might smile at the varieties of human conjecture concerning it: he might readily discern, perhaps, the height above the surface of the earth to which this fluid atmosphere reaches; he might exactly determine that peculiar form of its parts which gives it the spring or elasticity with which it is endued; he might distinguish which of its parts were pure, incorruptible air, and which only made for a little time to assume the appearance, so as to be quickly returned back to the element from whence it came. But as for us, who are immersed at the bottom of this gulf, we must be contented with a more confined knowledge; and, wanting a proper point of prospect, remain satisfied with a combination of the effects.

One of the first things that our senses inform us of is, that although the air is too fine for our sight, it is very obvious to our touch. Although we cannot see the wind contained in a bladder, we can very readily feel its resistance; and though the hurricane may want colour, we often fatally experience that it does not want force. We have equal experience of the air's spring or elasticity: the bladder, when pressed, returns again upon the pressure being taken away; a bottle, when filled, often bursts, from the spring of air which is included.

So far the slightest experience reaches; but, by carrying experiment a little farther, we learn, that air also is heavy; a round glass vessel being emptied of its air, and accurately weighed, has been found lighter than when it was weighed with the air in it. Upon computing the superior weight of the full vessel, a cubic foot of air is found to weigh something more than an ounce.

From this experiment, therefore, we learn, that the earth, and all things upon its surface, are every where covered with a ponderous fluid, which rising very high over our heads, must be proportionably heavy. For instance, as in the sea, a man at the depth of twenty feet sustains a greater weight of water, than a man at the depth of but ten feet; so will a man at the bottom of a valley have a greater weight of air over him, than a man on the top of a mountain.

From hence we may conclude, that we sustain a very great weight of air; and although, like men walking at the bottom of the sea, we cannot feel the weight which presses equally round us, yet the pressure is not the less real. As in morals, we seldom know the blessings that surround us till we are deprived of them; so here we do not perceive the weight of the ambient fluid till a part of it is taken away. If, by any means, we contrive to take away the pressure of the air from any one part of our bodies, we are soon made sensible of the weight upon the other parts. Thus, if we clap our hand upon the mouth of a vessel from whence the air has been taken away, there will thus be air on one side, and none on the other; upon which, we shall instantly find the hand violently sucked inwards; which is nothing more than the weight of the air upon the back of the hand that forces it into the space which is empty below.

As, by this experiment, we perceive that the air presses with great weight upon every thing on the surface of the earth, so by other experiments we learn the exact weight with which it presses. First, if the air be exhausted out of any vessel, a drinking vessel for instance,* and this vessel be set with the mouth downwards in water, the water will rise up into the empty space, and fill the inverted glass; for the external air will, in this case, press up the water where there is no weight to resist; as, one part of a bed being pressed, makes the other parts, that have no weight upon them, rise. In this case, as was said, the water being pressed without, will rise in the glass; and would continue to rise (if the empty glass were tall enough) thirty-two feet high. In fact, there have been pipes made purposely for this experiment, of above thirty-two feet high; in which, upon being exhausted, the water has always risen to the height of thirty-two feet: there it has always rested, and never ascended higher. From this, therefore, we learn, that the weight of the air which presses up the water, is equal to a pillar or column of water, which is thirty-two feet high: as it is just able to raise such a column, and no more. In other words, the surface of the earth is every where covered with a weight of air, which is equivalent to a covering of thirty-two feet deep of water; or to a weight of twenty-nine inches and a half of quicksilver, which is known to be just as heavy as the former.

Thus we see that the air, at the surface of the earth, is just as heavy as thirty-two feet of water, or twenty-nine inches and a half of quicksilver; and it is easily found, by computation, that to raise water thirty-two feet, will require a weight of fifteen pounds upon every square inch. Now, if we are fond of computations, we have only to calculate how many square inches are in the surface of an ordinary human body, and allowing every inch to sustain fifteen pounds, we may amaze ourselves at the weight of air we sustain. It has been computed, and found, that our ordinary load of air amounts to within a little of forty thousand pounds: this is wonderful! but wondering is not the way to grow wise.

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* This may be done by burning a bit of paper in the same, and then quickly turning it down upon the water.

Notwithstanding this be our ordinary load, and our usual supply, there are, at different times, very great variations. The air is not, like water, equally heavy at all seasons; but sometimes is lighter, and sometimes more heavy. It is sometimes more compressed, and sometimes more elastic or springy, which produces the same effects as an increase of its weight. The air, which at one time raises water thirty-two feet in the tube, and quicksilver twenty-nine inches, will not at another raise the one to thirty feet, or the other to twenty-six inches. This makes, therefore, a very great difference in the weight we sustain; and we are actually known, by computation, to carry at one time four thousand pounds of air more than at another.

The reason of this surprising difference in the weight of air, is either owing to its pressure from above, or to an increase of vapour floating in it. Its increased pressure is the consequence of its spring or elasticity, which cold and heat sensibly affect, and are continually changing.

This elasticity of the air is one of its most amazing properties; and to which it should seem nothing can set bounds. A body of air that may be contained in a nutshell, may easily, with heat, be dilated into a sphere of unknown dimensions. On the contrary, the air contained in a house, may be compressed into a cavity not larger than the eye of a needle. In short, no bounds can be set to its confinement or expansion; at least, experiment has hitherto found its attempts indefinite. In every situation, it retains its elasticity; and the more closely we compress it, the more strongly does it resist the pressure. If to the increasing the elasticity on one side by compression, we increase it on the other side by heat, the force of both soon becomes irresistible; and a certain French philosopher* supposed, that air thus confined and expanding, was sufficient for the explosion of a world.

Many instruments have been formed to measure and determine these different properties of the air; and which serve several useful purposes. The barometer serves to measure its weight; to tell us when it is heavier, and when lighter. It is composed of a glass tube or pipe, of about thirty inches in length, closed up at one end; this tube is then filled with quicksilver; this done, the maker clapping his finger upon the open end, inverts the tube, and plunges the open end, finger and all, into a bason of quicksilver, and then takes his finger away; now the quicksilver in the tube will, by its own weight, endeavour to descend into that in the bason; but the external air, pressing on the surface of the quicksilver in the bason without, and no air being in the tube at top, the quicksilver will continue in the tube, being pressed up, as was said, by the air, on the surface of the bason below. The height at which it is known to stand in the tube, is usually about twenty-nine inches, when the air is heavy; but not above twenty-six, when the air is very light. Thus, by this instrument, we can, with some exactness, determine the weight of the air; and, of consequence, tell before-hand the changes of the weather. Before fine dry weather, the air is charged with a variety of vapours, which float in it unseen, and render it extremely heavy, so that it presses up the quicksilver; or, in other words, the barometer rises. In moist, rainy weather, the vapours are washed down, or there is not heat sufficient for them to rise, so that the air is then sensibly lighter, and presses up the quicksilver with less force; or, in other words, the barometer is seen to fall. Our constitutions seem also to correspond with the changes of the weather-glass; they are braced, strong, and vigorous, with a large body of air upon them; they are languid, relaxed, and feeble, when the air is light, and refuses to give our fibres their proper tone.

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* Monsieur Amontons.

But although the barometer thus measures the weight of the air with exactness enough for the general purposes of life, yet it is often affected with a thousand irregularities, that no exactness in the instrument can remedy, nor no theory account for. When high winds blow, the quicksilver generally is low: it rises higher in cold weather than in warm; and is usually higher at morning and evening than at mid-day: it generally descends lower after rain than it was before it. There are also frequent changes in the air, without any sensible alteration in the barometer.

As the barometer is thus used in predicting the changes of the weather, so it is also serviceable in measuring the heights of mountains, which mathematicians cannot so readily do: for, as the higher we ascend from the surface of the earth, the air becomes lighter, so the quicksilver in the baromter will descend in proportion. It is found to sink at the rate of the tenth part of an inch for every ninety feet we ascend; so that in going up a mountain, if I find the quicksilver fallen an inch, I conclude, that I am got upon an ascent of near nine hundred feet high. In this there has been found some variation; into a detail of which, it is not the business of a natural historian to enter.

In order to determine the elasticity of air, the wind-gun has been invented, which is an instrument variously made; but in all upon the principle of compressing a large quantity of air into a tube, in which there is an ivory ball, and then giving the compressed elastic air free power to act, and drive the ball as directed. The ball, thus driven, will pierce a thick board; and will be as fatal, at small distances, as if driven with gunpowder. I do not know whether ever the force of this instrument has been assisted by means of heat; certain I am, that this, which could be very easily contrived by means of phosphorus, or any other hot substance applied to the barrel, would give such a force as I doubt whether gunpowder itself could produce.

The air-pump is an instrument contrived to exhaust the air from round a vessel adapted to that purpose, called a receiver. This method of exhausting, is contrived in the simple instrument, by a piston, like that of a syringe, going down into the vessel, and thus pushing out its air; which, by means of a valve, is prevented from returning into the vessel again. But this, like all other complicated instruments, will be better understood by a minute inspection, than an hour's description: it may suffice here to observe, that by depriving animals, and other substances, of all air, it shews us what the benefits and effects of air are in sustaining life, or promoting vegetation.

The digester is an instrument of still more extraordinary effects than any of the former; and sufficiently discovers the amazing force of air, when its elasticity is augmented by fire. A common tea-kettle, if the spout were closed up, and the lid put firmly down, would serve to become a digester, if strong enough. But the instrument used for this purpose is a strong metal pot, with a lid to screw close on, so that, when down, no air can get in or return: into this pot meat and bones are put, with a small quantity of water, and then the lid screwed close: a lighted lamp is put underneath, and, what is very extraordinary, (yet equally true) in six or eight minutes the whole mass, bones and all, are dissolved into a jelly; so great is the force and elasticity of the air contained within, struggling to escape, and breaking in pieces all the substances with which it is mixed. Care, however, must be taken not to heat this instrument too violently; for then the inclosed air would become irresistible, and burst the whole, with, perhaps, a fatal explosion.

There are numberless other useful instruments made to depend on the weight, the elasticity, or the fluidity of the air, which do not come within the plan of the present work; the design of which is not to give an account of the inventions that have been made for determining the nature and properties of air, but a mere narrative of its effects. The description of the pump, the forcing-pump, the fire-engine, the steam-engine, the syphon, and many others, belong not to the naturalist, but the experimental philosopher: the one gives a history of Nature, as he finds she presents herself to him; and he draws the obvious picture: the other pursues her with close investigation, tortures her by experiment to give up her secrets, and measures her latent qualities with laborious precision. Much more, therefore, might be said of the mechanical effects of air, and of the conjectures that have been made respecting the form of its parts; how some have supposed them to resemble little hoops, coiled up in a spring; others, like fleeces of wool; others, that the parts are endued with a repulsive quality, by which, when squeezed together, they endeavour to fly off, and recede from each other. We might have given the disputes relative to the height to which this body of air extends above us, and concerning which there is no agreement. We might have inquired how much of the air we breathe is elementary, and not reducible to any other substance; and of what density it would become, if it were supposed to be continued down to the centre of the earth. At that place we might, with the help of figures, and a bold imagination, have shown it twenty thousand times heavier than its bulk of gold. We might also prove it millions of times purer than upon earth, when raised to the surface of the atmosphere. But these speculations do not belong to natural history; and they have hitherto produced no great advantages in the branch of science to which they more properly appertain.

CHAPTER XIX.

AN ESSAY TOWARDS A NATURAL HISTORY OF THE AIR.

A LATE eminent philosopher has considered our atmosphere as one large chymical vessel, in which an infinite number of various operations are constantly performing. In it all the bodies of the earth are continually sending up a part of their substance by evaporation, to mix in this great alembic, and to float awhile in common. Here minerals, from their lowest depths, ascend in noxious, or in warm vapours, to make a part of the general mass; seas, rivers, and subterraneous springs, furnish their copious supplies; plants receive and return their share; and animals, that by living upon, consume this general store, are found to give it back in greater quantities when they die.* The air, therefore, that we breathe, and upon which we subsist, bears very little resemblance to that pure elementary body which was described in the last chapter; and which is rather a substance that may be conceived, than experienced to exist. Air, such as we find it, is one of the most compounded bodies in all nature. Water may be reduced to a fluid every way resembling air, by heat; which, by cold, becomes water again. Every thing we see gives off its parts to the air, and has a little floating atmosphere of its own round it. The rose is encompassed with a sphere of its own odorous particles; while the night-shade infects the air with a scent of a more ungrateful nature. The perfume of musk flies off in such abundance, that the quantity remaining becomes sensibly lighter by the loss. A thousand substances that escape all our senses, we know to be there; the powerful emanations of the load-stone, the effluvia of electricity, the rays of light, and the insinuations of fire. Such are the various substances through which we move, and which we are constantly taking in at every pore, and returning again with imperceptible discharge.

This great solution, or mixture of all earthly bodies, is continually operating upon itself; which, perhaps, may be the cause of its unceasing motion: but it operates still more visibly upon such grosser substances as are exposed to its influence; for scarcely any substance is found capable of resisting the corroding qualities of the air. The air, say the chymists, is a chaos, furnished with all kinds of salts and menstruums; and, therefore, it is capable of dissolving all kinds of bodies. It is well known, that copper and iron are quickly covered, and eaten with rust; and that in the climates near the equator, no art can keep them clean. In those dreary countries, the instruments, knives, and keys, that are kept in the pocket, are nevertheless quickly encrusted; and the great guns, with every precaution, after some years, become useless. Stones, as being less hard, may be readily supposed to be more easily soluble. The marble of which the noble monuments of Italian antiquity are composed, although in one of the finest climates in the world, shew the impressions which have been made upon them by the air. In many places they seem worm-eaten by time; and, in others, they appear crumbling into dust. Gold alone seems to be ex empted from this general state of dissolution; it is never found to contract rust, though exposed never so long; the reason of this seems to be, that sea-salt, which is the only menstruum capable of acting upon, and dissolving gold, is but very little mixed with the air; for salt being a very fixed body, and not apt to volatilize, and rise with heat, there is but a small proportion of it in the atmosphere. In the elaboratories, and shops, however, where salt is much used, and the air is impregnated with it, gold is found to rust as well as other metals.

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* Boyle, vol. ii. p. 593.

Bodies of a softer nature are obviously destroyed by the air.* Mr. Boyle says, that silks brought to Jamaica, will, if there exposed to the air, rot, even while they preserve their colour; but if kept therefrom, they both retain their strength and gloss. The same happens in Brasil, where their clothes, which are black, soon turn of an iron colour; though, in the shops, they preserve their proper hue.† In these tropical climates also, such are the putrescent qualities of the air, that white sugar will sometimes be full of maggots. Drugs and plasters lose their virtue, and become verminous. In some places they are obliged to expose the sweetmeats by day in the sun, otherwise the night air would quickly cause them to putrefy. On the contrary, in the cold arctic regions, animal substances, during their winter, are never known to putrefy; and meat may be kept for months without any salt whatsoever. This experiment happily succeeded with the eight Englishmen that were accidentally left upon the inhospitable coasts of Greenland, at a place where seven Dutchmen had perished but a few years before; for killing some rein-deer for their subsistence, and having no salt to preserve the flesh, to their great surprise they soon found it did not want any, as it remained sweet during their eight months' continuance upon that shore.

These powers with which air is endued over unorganized substances, are exerted in a still stronger manner over plants, animals of an inferior nature, and, lastly, over man himself. Most of the beauty, and the luxuriance of vegetation, is well known to be derived from the benign influence of the air: and every plant seems to have its favourite climate, not less than its proper soil. The lower ranks of animals also, seem formed for their respective climates, in which only they can live. Man alone seems the child of every climate, and capable of existing in all. However, this peculiar privilege does not exempt him from the influences of the air; he is as much subject to its malignity, as the meanest insect or vegetable.

With regard to plants, air is so absolutely necessary for their life and preservation, that they will not vegetate in an exhausted receiver. All plants have within them a quantity of air, which supports and agitates their juices. They are continually imbibing fresh nutriment from the air, to increase this store, and to supply the wants which they sustain from evaporation. When, therefore, the external air is drawn from them, they are no longer able to subsist. Even that quantity of air which they before were possessed of, escapes through their pores, into the exhausted receiver; and as this continues to be pumped away, they become languid, grow flaccid, and die. However

* Buffon, vol. iii. p. 62.

† Ibid, vol. iii. p. 68.

the plant or flower thus ceasing to vegetate, is kept, by being secured from the external air, a much longer time sweet than it would have continued, had it been openly exposed.

That air which is so necessary to the life of vegetables, is still more so to that of animals; there are none found, how seemingly torpid soever, that do not require their needful supply. Fishes themselves will not live in water from whence the air is exhausted; and it is generally supposed that they die in frozen ponds, from the want of this necessary to animal existence. Many have been the animals that idle curiosity has tortured in the prison of a receiver, merely to observe the manner of their dying. We shall, from a thousand instances produce that of the viper, as it is known to be one of the most vivacious reptiles in the world; and as we shall feel but little compassion for its tortures. Mr. Boyle took a new-caught viper, and shutting it up into a small receiver, began to pump away the air.* "At first, upon the air's being drawn away, it began to swell; some time after he had done pumping, it began to gape, and open its jaws; being thus compelled to open its jaws, it once more resumed its former lankness; it then began to move up and down within, as if to seek for air, and after a while foamed a little, leaving the foam sticking to the inside of the glass; soon after the body and neck grew prodigiously tumid, and a blister appeared upon its back; an hour and a half after the receiver was exhausted, the distended viper moved, and gave manifest signs of life; the jaws remained quite distended; as it were from beneath the epiglottis, came the black tongue, and reached beyond it; but the animal seemed, by its posture, not to have any life; the mouth also was grown blackish within; and in this situation it continued for twenty-three hours. But upon the air's being re-admitted, the viper's mouth was presently closed, and soon after opened again; and for some time those motions continued, which argued the remains of life." Such is the fate of the most insignificant or minute reptile that can be thus included. Mites, fleas, and even the little eels that are found swimming in vinegar, die for want of air. Not only these, but the eggs of these animals, will not produce in vacuo, but require air to bring them to perfection.

As in this manner air is necessary to their subsistence, so also it must be of a proper kind, and not impregnated with foreign mixtures. That factitious air which is pumped from plants or fluids, is generally, in a short time, fatal to them. Mr. Boyle has given us many experiments to this purpose. After having shewn that all vegetable, and most mineral substances, properly prepared, may afford air, by being placed in an exhausted receiver, and this in such quantities, that some have thought it a new substance, made by the alteration which the mineral or plant has undergone by the texture of its parts being loosened in the operation—having shewn, I say, that this air may be drawn in great quantities from vegetable, animal, or mineral substances, such as apples, cherries, amber burnt, or hartshorn†—he included a frog in artificial air, produced from paste; in seven minutes' space it suffered convulsions, and at last lay still, and being taken out, recovered no motion at all, but was dead. A bird inclosed in artificial air, from raisins, died in a quarter of a minute, and never stirred more. A snail was put into the receiver, with air of paste; in four minutes it ceased to move, and was dead, although it had survived in vacuo for several hours: so that factitious air proved a greater enemy to animals than even a vacuum itself.

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* Boyle's Physico-Mechan. Exper. passim

† Boyle's Physico-Mechan. vol. ii. p. 598.

Air also may be impregnated with fumes that are instantly fatal to animals. The fumes of hot iron, copper, or any other heated metal, blown into the place where an animal is confined, instantly destroy it. We have already mentioned the vapours in the grotto Del Cane suffocating a dog. The ancients even supposed, that these animals, as they always ran with their noses to the ground, were the first that felt any infection. In short, it should seem that the predominance of any one vapour, from any body, how wholesome soever in itself, becomes infectious; and that we owe the salubrity of the air to the variety of its mixture.

But there is no animal whose frame is more sensibly affected by the changes of the air than man. It is true, he can endure a greater variety of climates than the lower orders generally are able to do; but it is rather by the means which he has discovered of obviating their effects, than by the apparent strength of his constitution. Most other animals can bear cold or hunger better, endure greater fatigues in proportion, and are satisfied with shorter repose. The variations of the climate, therefore, would probably affect them less, if they had the same means or skill in providing against the severities of the change. However this be, the body of man is an instrument much more nicely sensible of the variations of the air, than any of those which his own art has produced; for his frame alone seems to unite all their properties, being invigorated by the weight of the air, relaxed by its moisture, enfeebled by its heat, and stiffened by its frigidity.

But it is chiefly by the predominance of some peculiar vapour, that the air becomes unfit for human support. It is often found, by dreadful experience, to enter into the constitution, to mix with its juices, and to putrefy the whole mass of blood. The nervous system is not less affected by its operations; palsies and vertigoes are caused by its damps; and a still more fatal train of distempers by its exhalations. In order that the air should be wholesome, it is necessary, as we have seen, that it should not be of one kind, but the compound of several substances; and the more various the composition, to all appearance the more salubrious. A man, therefore, who continues in one place, is not so likely to enjoy this wholesome variety, as he who changes his situation; and, if I may so express it, instead of waiting for a renovation of air, walks forward to meet its arrival. This mere motion, independent even of the benefits of exercise, becomes wholesome, by thus supplying a great variety of that healthful fluid by which we are sustained.

A thousand accidents are found to increase these bodies of vapour, that make one place more or less wholesome than another. Heat may raise them in too great quantities; and cold may stagnate them. Minerals may give off their effluvia in such proportion as to keep away all other kind of air; vegetables may render the air unwholesome by their supply; and animal putrefation seems to furnish a quantity of vapour, at least as noxious as any of the former. All these united, generally make up the mass of respiration, and are, when mixed together, harmless; but any one of them, for a long time singly predominant, becomes at length fatal.

The effects of heat in producing a noxious quality in the air, are well known. Those torrid regions under the Line are always unwholesome. At Senegal, I am told, the natives consider forty as a very advanced time of life, and generally die of old age at fifty. At Carthagena,* in America, where the heat of the hottest day ever known in Europe is continual, where, during their winter season, these dreadful heats are united with a continual succession of thunder, rain, and tempests, arising from their intenseness, the wan and livid complexions of the inhabitants might make strangers suspect that they were just recovered from some dreadful distemper; the actions of the natives are conformable to their colour; in all their motions there is somewhat relaxed and languid; the heat of the climate even affects their speech, which is soft and slow, and their words generally broken. Travellers from Europe retain their strength and ruddy colour in that climate, possibly for three or four months; but afterwards suffer such decays in both, that they are no longer to be distinguished from the inhabitants by their complexion. However, this languid and spiritless existence is frequently drawled on sometimes even to eighty. Young persons are generally most affected by the heat of the climate, which spares the more aged; but all, upon their arrival on the coasts, are subject to the same train of fatal disorders. Few nations have experienced the mortality of these coasts, so much as our own: in our unsuccessful attack upon Carthagena, more than three parts of our army were destroyed by the climate alone; and those that returned from that fatal expedition, found their former vigour irretrievably gone. In our more fortunate expedition, which gave us the Havana, we had little reason to boast of our success; instead of a third, not a fifth part of the army were left survivors of their victory, the climate being an enemy that even heroes cannot conquer.

The distempers that thus proceed from the cruel malignity of those climates, are many: that, for instance, called the *Chapotonadas*, carries off a multitude of people; and extremely thins the crews of European ships, whom gain tempts into those inhospitable regions. The nature of this distemper is but little known, being caused in some persons by cold, in others by indigestion. But its effects are far from being obscure; it is generally fatal in three or four days: upon its seizing the patient, it brings on what is there called the *black vomit*, which is the sad symptom after which none are ever found to recover. Some, when the vomit attacks them, are seized with a delirium, that, were they not tied down, they would tear themselves to pieces, and thus expire in the midst of this furious paroxysm. This disorder, in milder climates, takes the name of the *bilious fever*, and is attended with milder symptoms, but very dangerous in all.

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* Ulloa, vol. i. p. 42

There are many other disorders incident to the human body, that seem the offspring of heat; but to mention no other, that very lassitude which prevails in all the tropical climates, may be considered as a disease. The inhabitants of India,* says a modern philosopher, sustain an unceasing languor, from the heats of their climate, and are torpid in the midst of profusion. For this reason, the great Disposer of nature has clothed their country with trees of an amazing height, whose shade might defend them from the beams of the sun; and whose continual freshness might, in some measure, temperate their fierceness. From these shades, therefore, the air receives refreshing moisture, and animals a cooling protection. The whole race of savage animals retire, in the midst of the day, to the very centre of the forest, not so much to avoid their enemy man, as to find a defence against the raging heats of the season. This advantage which arises from shade in torrid climates, may probably afford a solution for that extraordinary circumstance related by Boyle, which he imputes to a different cause. In the island of Ternate, belonging to the Dutch, a place that had been long celebrated for its beauty and healthfulness, the clove-trees grew in such plenty, that they in some measure lessened their own value: for this reason, the Dutch resolved to cut down the forests, and thus to raise the price of the commodity: but they had soon reason to repent of their avarice; for such a change ensued, by cutting down the trees, that the whole island, from being healthy and delightful, having lost its charming shades, became extremely sickly, and has actually continued so to this day. Boerhaave considered heat so prejudicial to health, that he was never seen to go near a fire.

An opposite set of calamities are the consequence, in climates where the air is condensed by cold. In such places, all that train of distempers which are known to arise from obstructed perspiration, are very common;† eruptions, boils, scurvy, and a loathsome leprosy, that covers the whole body with a scurf, and white putrid ulcers. These disorders also are infectious; and, while they thus banish the patient from society, they generally accompany him to the grave. The men of those climates seldom attain to the age of fifty; but the women, who do not lead such laborious lives, are found to live longer.

The autumnal complaints which attend a wet summer, indicate the dangers of a moist air. The long continuance of an east wind also, shews the prejudice of a dry one. Mineral exhalations, when copious, are every where known to be fatal; and although we probably owe the increase and luxuriance of vegetation to a moderate degree of their warmth, yet the natives of those countries where there are mines in plenty, but too often experience the noxious effects of their vicinity. Those trades also that deal in the preparations of metals of all kinds, are always unwholesome; and the workmen, after some time, are generally seen to labour under palsies, and other nervous complaints. The vapours from some vegetable substances are well known to be attended with dangerous effects. The shade of the machinel tree, in America, is said to be fatal, as was that of the juniper, if we may credit the ancients. Those who walk through fields of poppies, or in any

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* Linnæi Amenitates, vol. v. p. 444

† Crantz's History of Greenland, vol. i. p. 236

[illegible] prepare those flowers for making opium, are very sensibly affected with the drowsiness they occasion. A physician of Mr. Boyle's acquaintance, causing a large quantity of black hellebore to be pounded in a mortar, most of the persons who were in the room, and especially the person who pounded it, were purged by it, and some of them strongly. He also gathered a certain plant in Ireland, which the person who beat in a mortar, and the physician who was standing near, were so strongly affected by, that their hands and faces swelled to an enormous size, and continued tumid for a long time after

But neither mineral nor vegetable steams are so dangerous to the constitution, as those proceeding from animal substances, putrefying either by disease or death. The effluvia that comes from diseased bodies, propagate that frightful catalogue of disorders which are called *infectious*. The parts which compose vegetable vapours and mineral exhalations, seem gross and heavy, in comparison of these volatile vapours, that go to great distances, and have been described as spreading desolation over the whole earth. They fly every where; penetrate every where; and the vapours that fly from a single disease, render it soon epidemic.

The plague is the first upon the list in this class of human calamities. From whence this scourge of man's presumption may have its beginning, is not well known: but we well know that it is propagated by infection. Whatever be the general state of the atmosphere, we learn, from experience, that the noxious vapours, though but singly introduced at first, taint the air by degrees; every person infected tends to add to the growing malignity; and, as the disorder becomes more general, the putrescence of the air becomes more noxious, so that the symptoms are aggravated by continuance. When it is said that the origin of this disorder is unknown, it implies, that the air seems to be but little employed in first producing it. There are some countries, even in the midst of Africa, that we learn have never been infected with it; but continue, for centuries, unmolested. On the contrary, there are others, that are generally visited once a year, as in Egypt, which, nevertheless, seems peculiarly blessed with the serenity and temperature of its climate. In the former countries, which are of vast extent, and many of them very populous, every thing should seem to dispose the air to make the plague continual among them. The great heats of the climate, the unwholesomeness of the food, the sloth and dirt of the inhabitants, but, above all, the bloody battles which are continually fought among them, after which heaps of dead bodies are left unburied, and exposed to putrefaction. All these one might think would be apt to bring the plague among them, and yet, nevertheless, we are assured by Leo Africanus, that in Numidia the plague is not known once in a hundred years; and that in Negroland, it is not known at all. This dreadful disorder, therefore, must have its rise, not from any previous disposition of the air, but from some particular cause, beginning with one individual, and extending the malignity, by communication, till at last the air becomes actually tainted by the generality of the infection.

The plague which spread itself over the whole world, in the year 1346, as we are told by Mezeray, was so contagious, that scarce a vil lage, or even a house, escaped being infected by it. Before it had reached Europe, it had been for two years travelling from the great kingdom of Cathay, where it began by a vapour most horridly fœtid; this broke out of the earth like a subterranean fire, and upon the first instant of its eruption, consumed and desolated above two hundred leagues of that country, even to the trees and stones.

In that great plague which desolated the city of London, in the year 1665, a pious and learned schoolmaster of Mr. Boyle's acquaintance, who ventured to stay in the city, and took upon him the humane office of visiting the sick and the dying, who had been deserted by better physicians, averred, that being once called to a poor woman who had buried her children of the plague, he found the room where she lay so little that it scarce could hold any more than the bed whereon she was stretched. However, in this wretched abode, beside her, in an open coffin, her husband lay, who had some time before died of the same disease; and whom she, poor creature, soon followed. But what shewed the peculiar malignity of the air, thus suffering from animal putrefaction, was, that the contagious steams had produced spots on the very wall of their wretched apartment: and Mr. Boyle's own study, which was contiguous to a pesthouse, was also spotted in the same frightful manner. Happily for mankind, this disorder, for more than a century has not been known in our island; and, for this last age, has abated much of its violence, even in those countries where it is most common. Diseases, like empires, have their revolutions; and those which for a while were the scourge of mankind, sink unheard of, to give place to new ones, more dreadful, as being less understood.

For this revolution in disorders, which has employed the speculation of many, Mr. Boyle accounts in the following manner: "Since," says he, "there want not causes in the bowels of the earth, to make considerable changes amongst the materials that Nature has plentifully treasured up in those magazines, and as those noxious steams are abundantly supplied to the surface, it may not seem improbable, that in this great variety, some may be found capable of affecting the human frame in a particular manner, and thus of producing new diseases. The duration of these may be greater or less, according to the lastingness of those subterraneous causes that produced them. On which account, it need be no wonder that some diseases have but a short duration, and vanish not long after they appear; whilst others may continue longer, as having under ground more settled and durable causes to maintain them."

From the recital of this train of mischiefs produced by the air, upon minerals, plants, animals, and man himself, a gloomy mind may be apt to dread this indulgent nurse of nature as a cruel and an inexorable step-mother: but it is far otherwise; and, although we are sometimes injured, yet almost all the comforts and blessings of life spring from its propitious influence. It would be needless to observe that it is absolutely necessary for the support of our lives; for of this every moment's experience assures us. But how it contributes to this support, is not so readily comprehended. All allow it to be a friend, to whose benefits we are constantly obliged; and yet, to this hour, philosophers are divided as to the nature of the obligation The dispute is whether the air is only useful by its weight to force our juices into circulation:[*] or, whether, by containing a peculiar spirit, it mixes with the blood in our vessels, and acts like a spur to their industry.[†] Perhaps it may exert both these useful offices at the same time. Its weight may give the blood its progressive motion, through the larger vessels of the body; and its admixture with it, cause those contractions of all the vessels, which serve to force it still more strongly forward, through the minutest channels of the circulation. Be this as it may, it is well known, that that part of our blood which has just received the influx of the air in our bodies, is of a very different colour from that which has almost performed its circuit. It has been found, that the arterial blood which has been immediately mixed with the air in the lungs, and, if I may so express it, is just beginning its journey through the body, is of a fine florid scarlet colour; while, on the contrary, the blood of the veins that is returning from having performed its duty, is of a blackish crimson hue. Whence this difference of colour should proceed, is not well understood; we only know the fact, that this florid colour is communicated by the air; and we are well convinced, that this air has been admitted into the blood for very useful purposes.

Besides this vital principlo in animals, the air also gives life and body to flame. A candle quickly goes out in an exhausted receiver; for having soon consumed the quantity of air, it then expires for want of a fresh supply. There has been a flame contrived that will burn under water; but none has yet been found, that will continue to burn without air. Gunpowder, which is the most catching and powerful fire we know, will not go off in an exhausted receiver: nay, if a train of gunpowder be laid, so as that one part may be fired in the open air, yet the other part in vacuo will remain untouched, and unconsumed. Wood also set on fire, immediately goes out; and its flame ceases upon removing the air; for something is then wanting to press the body of the fire against that of the fuel, and to prevent the too speedy diffusion of the flame. We frequently see cooks, and others, whose business it is to keep up strong fires, take proper precautions to exclude the beams of the sun from shining upon them, which effectually puts them out. This they are apt to ascribe to a wrong cause; namely, the operation of the light; but the real fact is, that the warmth of the sun-beams lessens and dissipates the body of the air that goes to feed the flame; and the fire, of consequence, languishes for want of a necessary supply.

The air, while it thus kindles fire into flame, is, notwithstanding, found to moderate the rays of light, to dissipate their violence, and to spread a uniform lustre over every object. Were the beams of the sun to dart directly upon us, without passing through this protecting medium, they would either burn us up at once, or blind us with their effulgence. But by going through the air, they are reflected, refracted, and turned from their direct course, a thousand different ways; and thus are more evenly diffused over the face of nature.

Among the other necessary benefits the air is of to us, one of the principal is its conveyance of sound. Even the vibrations of a bell, which have the loudest effect that we know of, cease to be heard, when under the receiver of an air-pump. Thus all the pleasures we receive from conversation with each other, or from music, depend entirely upon the air.

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[*] Keil. Robinson.

[†] Whytt upon vital and involuntary Motions.

Odours likewise are diffused only by the means of air; without this fluid to swim in, they would for ever remain torpid in their respective substances; and the rose would affect us with as little sensations of pleasure, as the thorn on which it grew.

Those who are willing to augment the catalogue of the benefits we receive from this element, assert also, that tastes themselves would be insipid, were it not that the air presses their parts upon the nerves of the tongue and palate, so as to produce their grateful effects. Thus, continue they, upon the tops of high mountains, as on the Peak of Teneriffe, the most poignant bodies, as pepper, ginger, salt, and spice, have no sensible taste, for want of their particles being thus sent home to the sensory. But we owe the air sufficient obligations, not to be studious of admitting this among the number: in fact, all substances have their taste, as well on the tops of the mountains, as in the bottom of the valley; and I have been one of many, who have ate a very savoury dinner on the Alps.

It is sufficient, therefore, that we regard the air as the parent of health and vegetation; as a kind dispenser of light and warmth; and as the conveyer of sounds and odours. This is an element of which avarice will not deprive us; and which power cannot monopolize. The treasures of the earth, the verdure of the fields, and even the refreshments of the stream, are too often seen going only to assist the luxuries of the great; while the less fortunate part of mankind stand humble spectators of their encroachments. But the air no limitations can bound, nor any landmarks restrain. In this benign element, all mankind can boast an equal possession; and for this we all have equal obligations to Heaven. We consume a part of it, for our own sustenance, while we live; and, when we die, our putrefying bodies give back the supply, which, during life, we had accumulated from the general mass.

CHAPTER XX.

OF WINDS, IRREGULAR AND REGULAR.

Wind is a current of air. Experimental philosophers produce an artificial wind, by an instrument called an *æolipile.* This is nothing more than a hollow copper ball, with a long pipe; a tea-kettle might be readily made into one, if it were entirely closed at the lid, and the spout left open; through this spout it is to be filled with water, and then set upon the fire, by which means it produces a violent blast, like wind, which continues while there is any water remaining in the instrument. In this manner water is converted into a rushing air; which, if caught as it goes out, and left to cool, is again quickly converted into its former element. Besides this, as was mentioned in the former chapter, almost every substance contains some portions of air: Vegetables, or the bodies of animals left to putrefy, produce it in a very copious manner. But it is not only seen thus escaping from bodies, but it may be very easily made to enter into them. A quantity of air may be compressed into water, so as to be intimately blended with it. It finds a much easier admission into wine, or any fermented liquor; and an easier still, into spirits of wine. Some salts suck up the air in such quantities, that they are made sensibly heavier thereby, and often are melted by its moisture. In this manner, most bodies, being found either capable of receiving or affording it, we are not to be surprised at those streams of air that are continually fleeting round the globe.—Minerals, vegetables, and animals, contribute to increase the current; and are sending off their constant supplies. These, as they are differently affected by cold or heat, by mixture or putrefaction, all yield different quantities of air at different times; and the loudest tempests, and most rapid whirlwinds, are formed from their united contributions.

The sun is the principal instrument in rarefying the juices of plants, so as to give an escape to their imprisoned air; it is also equally operative in promoting the putrefaction of animals. Mineral exhalations are more frequently raised by subterranean heat. The moon, the other planets, the seasons, are all combined in producing these effects in a smaller degree. Mountains give a direction to the courses of the air. Fires carry a current of air along their body. Night and day alternately chill and warm the earth, and produce an alternate current of its vapours. These, and many other causes, may be assigned for the variety, and the activity of the winds, their continual change, and uncertain duration.

With us on land, as the wind proceeds from so many causes, and meets such a variety of obstacles, there can be but little hopes of ever bringing its motions to conform to theory; or of foretelling how it may blow a minute to come. The great Bacon, indeed, was of opinion, that by a close and regular history of the winds, continued for a number of ages together, and the particulars of each observation reduced to general maxims, we might at last come to understand the variations of this capricious element; and that we could foretell the certainty of a wind, with as much ease as we now foretell the return of an eclipse. Indeed, his own beginnings in this arduous undertaking seem to speak the possibility of its success; but, unhappily for mankind, this investigation is the work of ages, and we want a Bacon to direct the process.

To be able, therefore, with any plausibility, to account for the variations of the wind upon land, is not to be at present expected; and to understand any thing of their nature, we must have recourse to those places where they are more permanent and steady. This uniformity and steadiness we are chiefly to expect upon the ocean. There, where there is no variety of substances to furnish the air with various and inconstant supplies, where there are no mountains to direct the course of its current, but where all is extensively uniform and even; in such a place, the wind arising from a simple cause, must have but one simple motion. In fact, we find it so. There are many parts of the world where the winds, that with us are so uncertain, pay their stated visits. In some places they are found to blow one way by day, and another by night; in others, for one half of the year they go in a direction contrary to their former course: but what is more extraordinary still, there are some places where the winds never change, but for ever blow the same way. This is particularly found to obtain between the tropics in the Atlantic and Æthiopic oceans; as well as in the great Pacific sea.

Few things can appear more extraordinary to a person who has never been out of our variable latitudes, than this steady wind, that for ever sits in the sail, sending the vessel forward; and as effectually preventing its return. He who has been taught to consider that nothing in the world is so variable as the winds, must certainly be surprised to find a place where there is nothing more uniform. With us their inconstancy has become a proverb; with the natives of those distant climates they may talk of a friend or a mistress as fixed and unchangeable as the winds, and mean a compliment by the comparison. When our ships are once arrived into the proper latitudes of the great Pacific ocean, the mariner forgets the helm, and his skill becomes almost useless: neither storms nor tempests are known to deform the glassy bosom of that immense sheet of waters: a gentle breeze, that forever blows in the same direction, rests upon the canvass, and speeds the navigator. In the space of six weeks, ships are thus known to cross an immense ocean, that takes more than so many months to return. Upon returning, the trade-wind, which has been propitious, is then avoided; the mariner is generally obliged to steer into the northern latitudes, and to take the advantage of every casual wind that offers, to assist him into port. This wind, which blows with such constancy one way, is known to prevail not only in the Pacific ocean, but also in the Atlantic, between the coasts of Guinea and Brazil; and, likewise, in the Æthiopic ocean. This seems to be the great universal wind, blowing from the east to the west, that prevails in all the extensive oceans, where the land does not frequently break the general current. Were the whole surface of the globe an ocean, there would probably be but this one wind, for ever blowing from the east, and pursuing the motions of the sun westward. All the other winds seem subordinate to this; and many of them are made from the deviations of its current. To form, therefore, any conception relative to the variations of the wind in general, it is proper to begin with that which never varies.

There have been many theories to explain this invariable motion of the winds; among the rest, we cannot omit that of Dr. Lyster, for its strangeness. "The sea," says he, "in those latitudes, is generally covered over with green weeds, for a great extent; and the air produced from the vegetable perspiration of these, produces the trade-wind." The theory of Cartesius was not quite so absurd. He alleged, that the earth went round faster than its atmosphere at the equator; so that its motion, from west to east, gave the atmosphere an imaginary one from east to west; and thus an east wind was eternally seen to prevail. Rejecting those arbitrary opinions, conceived without force, and asserted without proof, Dr. Halley has given one more plausible; which seems to be the reigning system of the day.

To conceive his opinion clearly, let us for a moment suppose the whole surface of the earth to be an ocean, and the air encompassing it on every side, without motion. Now it is evident, that that part of the air which lies directly under the beams of the sun, will be rarefied; and if the sun remained for ever in the same place, there would be a great vacuity in the air, if I may so express it, beneath the place where the sun stood. The sun moving forward, from east to west, this vacuity will follow too, and still be made under it. But while it goes on to make new vacuities, the air will rush in to fill up those the sun has already made; in other words, as it is still travelling forward, the air will continually be rushing in behind, and pursue its motions from east to west. In this manner the air is put into motion by day; and by night the parts continue to impel each other, till the next return of the sun, that gives a new force to the circulation.

In this manner is explained the constant east wind that is found blowing round the globe, near the equator. But it is also known, that as we recede from the equator on either side, we come into a trade-wind, that continually blows from the poles, from the north on one side, or the south on the other, both directing towards the equator. This also proceeds from a similar cause with the former; for the air being more rarefied in those places over which the sun more directly darts its rays, the currents will come both from the north and the south, to fill up the intermediate vacuity.

These two motions, namely, the general one from east to west, and the more particular one from both the poles, will account for all the phænomena of trade-winds; which, if the whole surface of the globe were sea, would undoubtedly be constant, and for ever continue to blow in one direction. But there are a thousand circumstances to break these air-currents into smaller ones; to drive them back against their general course; to raise or depress them; to condense them into storms, or to whirl them in eddies. In consequence of this, regard must be often had to the nature of the soil, the position of the high mountains, the course of the rivers, and even to the luxuriance of vegetation.

If a country lying directly under the sun be very flat and sandy, and if the land be low and extensive, the heats occasioned by the reflection of the sun-beams produces a very great rarefaction of the air. The deserts of Africa, which are conformable to this description, are scarcely ever fanned by a breath of wind by day; but the burning sun is continually seen blazing in intolerable splendour above them. For this reason, all along the coasts of Guinea, the wind is always perceived blowing in upon land, in order to fill up the vacuity caused by the sun's operation. In those shores, therefore, the wind blows in a contrary direction to that of its general current; and is constantly found setting in from the west.

From the same cause it happens, that those constant calms, attended with deluges of rain, are found in the same part of the ocean. For this tract being placed in the middle, between the westerly winds blowing on the coast of Guinea, and the easterly trade-winds that move at some distance from shore, in a contrary direction, the tendency of that part of the air that lies between these two opposite currents is indifferent to either, and so rests between both in torpid serenity; and the weight of the incumbent atmosphere, being diminished by the continual contrary winds blowing from hence, it is unable to keep the vapours suspended that are copiously borne thither; so that they fall in continual rains.

But it is not to be supposed, that any theory can account for all the phænomena of even those winds that are known to be most regular. Instead of a complete system of the trade-winds, we must rather be content with an imperfect history. These,* as was said, being the result of a combination of effects, assume as great a variety as the causes producing them are various.

Besides the great general wind above-mentioned, in those parts of the Atlantic that lie under the temperate zone, a north wind prevails constantly during the months of October, November, December, and January. These, therefore, are the most favourable months for embarking for the East-Indies, in order to take the benefit of these winds, for crossing the Line: and it has been often found, by experience, that those who had set sail five months before, were not in the least farther advanced in their voyage, than those who waited for the favourable wind. During the winter, off Nova Zembla, and the other arctic countries, a north wind reigns almost continually. In the Cape de Verde Islands, a south wind prevails during the month of July. At the Cape of Good Hope, a northwest wind blows during the month of September. There are also regular winds, produced by various causes, upon land. The ancient Greeks were the first who observed a constant breeze, produced by the melting of the snows, in some high neighbouring countries. This was perceived in Greece, Thrace, Macedonia, and the Ægean sea. The same kind of winds are now remarked in the kingdom of Congo, and the most southern parts of Africa. The flux and reflux of the sea also produces some regular winds, that serve the purposes of trade; and, in general, it may be observed, that wherever there is a strong current of water, there is a current of air that seems to attend it.

Beside these winds that are found to blow in one direction, there are, as was said before, others that blow for certain months of the year one way, and the rest of the year the contrary way; these are called the *Monsoons*, from a famous pilot of that name, who first used them in navigation with success.† In all that part of the ocean that lies between Africa and India, the east winds begin at the month of January, and continue till about the commencement of June. In the month of August or September, the contrary direction takes place; and the west winds prevail for three or four months. The interval between these winds, that is to say, from the end of June to the beginning of August, there is no fixed wind; but the sea is usually tossed by violent tempests, proceeding from the north. These winds are always subject to their greatest variations, as they approach the land; so that on one side of the great peninsula of India, the coasts are, for near half the year, harassed by violent hurricanes, and northern tempests; while, on the opposite side, and all along the coasts of Coromandel, these dreadful tempests are wholly unknown. At Java, and Ceylon, a west wind begins to reign in the month of September; but at fifteen degrees of south latitude, this wind is found to be lost, and the great general trade-wind from the east is perceived to prevail. On the contrary, at Cochin, in China, the west wind begins in March; so that these monsoons prevail, at different seasons, throughout the Indies. So that the mariner takes one part of the year to go from Java to the Moluccas; another from Cochin to Molucca; another from Molucca to China; and still another to direct him from China to Japan.

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* Buffon, vol. ii. p. 230.

† Varenii Geographia Generalis, cap. 20

There are winds also that may be considered as peculiar to certain coasts: for example, the south wind is almost constant upon the coasts of Chili and Peru; western winds almost constantly prevail on the coast of Terra Magellanica; and in the environs of the Straits le Maire. On the coasts of Malabar, north and north-west winds prevail continually; along the coast of Guinea, the north-west wind is also very frequent; and, at a distance from the coasts, the north-east is always found prevailing. From the beginning of November to the end of December, a west wind prevails on the coasts of Japan; and, during the whole winter, no ships can leave the port of Cochin, on account of the impetuosity of the winds that set upon the coast. These blow with such vehemence, that the ports are entirely choked up with sand, and even boats are not able to enter. However, the east winds that prevail for the other half of the year, clear the mouths of their harbours from the accumulations of the preceding winter, and set the confined ships at liberty. At the Straits of Babelmandel, there is a south wind that periodically returns, and which is always followed by a north-east.

Besides winds thus peculiar to certain coasts, there are others found to prevail on all the coasts, in warm climates, which, during one part of the day, blow from the shore, and, during another part of it, blow from the sea. The sea-breeze, in those countries, as Dampier observes, commonly rises in the morning about nine, proceeding slowly, in a fine small black curl, upon the surface of the the water, and making its way to refresh the shore. It is gentle at first, but increases gradually till twelve, then insensibly sinks away, and is totally hushed at five. Upon its ceasing, the land-breeze begins to take its turn, which increases gradually till twelve at night, and is succeeded, in the morning, by the sea-breeze again. Without all doubt, nothing could be more fortunate, for the inhabitants of the warm countries, where those breezes blow, than this alternate refreshment, which they feel at those seasons when it is most wanted. The heat, on some coasts, would be insupportable, were it not for such a supply of air, when the sun has rarefied all that which lay more immediately under the coast. The sea-breeze temperates the heat of the sun by day; and the land-breeze corrects the malignity of the dews and vapours by night. Where these breezes, therefore, prevail, and they are very common, the inhabitants enjoy a share of health and happiness, unknown to those that live much farther up the country, or such as live in similar latitudes without this advantage. The cause of these obvi ously seems to arise from the rarefaction of the air by the sun, as their duration continues with its appearance, and alters when it goes down. The sun, it is observed, equally diffusing his beams upon land and sea the land, being a more solid body than the water, receives a greater quantity of heat, and reflects it more strongly. Being thus, therefore, heated to a greater degree than the waters, it, of consequence, drives the air from land out to sea; but, its influence being removed, the air returns to fill up the former vacuity. Such is the usual method of accounting for this phænomenon; but, unfortunately, these sea and land breezes are visitants that come at all hours. On the coasts of Malabar,* the land-breezes begin at midnight, and continue till noon; then the sea-breezes take their turn, and continue till midnight. While again, at Congo, the land-breezes begin at five, and continue till nine the next day.

But if the cause of these be so inscrutable, that are, as we see, tolerably regular in their visitations, what shall we say to the winds of our own climate, that are continually shifting, and incapable of rest? Some general causes may be assigned, which nothing but particular experience can apply. And, in the first place, it may be observed, that clouds, and heat, and in short, whatever either increases the density or the elasticity of the air, in any one place, will produce a wind there: for the increased activity of the air thus pressing more powerfully on the parts of it that are adjacent, will drive them forward, and thus go on, in a current, till the whole comes to an equality.

In this manner, as a denser air produces a wind on one hand; so will any accident, that contributes to lighten the air, produce it on the other: for, a lighter air may be considered as a vacuity, into which the neighbouring air will rush: and hence it happens, that when the barometer marks a peculiar lightness in the air, it is no wonder that it foretels a storm.

The winds upon large waters are generally more regular than those upon land. The wind at sea generally blows with an even steady gale; the wind at land puffs by intervals, increasing its strength, and remitting it, without any apparent cause. This, in a great measure, may be owing to the many mountains, towers, or trees, that it meets in its way, all contributing either to turn it from its course, or interrupt its passage.

The east wind blows more constantly than any other, and for an obvious reason: all other winds are, in some measure, deviations from it, and partly may owe their origin thereto. It is generally likewise the most powerful, and for the same reason.

There are often double currents of the air. While the wind blows one way, we frequently see the clouds move another. This is generally the case before thunder; for it is well known that the thunder-cloud always moves against the wind: the cause of this surprising appearance has hitherto remained a secret. From hence we may conclude, that weathercocks only inform us of that current of the air, which is near the surface of the earth; but are often erroneous with regard to the upper regions, and, in fact, Derham has often found them erroneous

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* Buffon, vol. ii. p. 252.

Winds are generally more powerful on elevated situations than on the plain, because their progress is interrupted by fewer obstacles. In proportion as we ascend the heights of a mountain, the violence of the weather seems to increase until we have got above the region of storms, where all is usually calm and serene. Sometimes, however, the storms rise even to the tops of the highest mountains; as we learn from those who have been on the Andes, and as we are convinced by the deep snows that crown even the highest.

Winds b owing from the sea are generally moister, and more attended with rains, than those which blow over extensive tracts of land; for the sea gives off more vapours to the air, and these are rolled forward upon land, by the wind's blowing from thence.* For this reason our easterly winds, that blow from the continent, are dry, in comparison of those that blow from the surface of the ocean, with which we are surrounded on every other quarter.

In general the winds are more boisterous in spring and autumn than at other seasons: for that being the time of high tides, the sea may communicate a part of its motions to the winds. The sun and moon, also, which then have a greater effect upon the waters, may also have some influence upon the winds: for, there being a great body of air surrounding the globe, which, if condensed into water, would cover it to the depth of thirty-two feet, it is evident that the sun and moon will, to a proportionable degree, affect the atmosphere, and make a tide of air. This tide will be scarcely perceivable, indeed; but, without doubt, it actually exists; and may contribute to increase the vernal and autumnal storms, which are then known to prevail.

Upon narrowing the passage through which the air is driven, both the density and the swiftness of the wind is increased. For, as currents of water flow with greater force and rapidity by narrowing their channels, so also will a current of air, driven through a contracted space, grow more violent and irresistible. Hence we find those dreadful storms that prevail in the defiles of mountains, where the wind, pushing from behind through a narrow channel, at once increases in speed and density, levelling, or tearing up, every obstacle that rises to obstruct its passage.

Winds reflected from the sides of mountains and towers, are often found to be more forceful than those in direct progression. This we frequently perceive near lofty buildings, such as churches or steeples, where winds are generally known to prevail, and are much more powerful than at some distance. The air, in this case, by striking against the side of the building, acquires additional density, and, therefore. blows with more force.

These different degrees of density, which the air is found to possess, sufficiently shew that the force of the winds do not depend upon their velocity alone; so that those instruments called *anemometers*, which are made to measure the velocity of the wind, will by no means give us certain information of the force of the storm. In order to estimate this with exactness, we ought to know its density; which also these are not calculated to discover. For this reason we often see storms, with very powerful effects, that do not seem to shew any great speed; and, on the contrary, we see these wind-measurers go round with great swiftness, when scarce any damage has followed from the storm.

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* Derham's Physico-Theol.

Such is the nature and the inconstancy of the irregular winds with which we are best acquainted. But their effects are much more formidable in those climates near the tropics, where they are often found to break in upon the steady course of the trade-winds, and to mark their passage with destruction. With us, the tempest is but rarely known, and its ravages are registered as an uncommon calamity; but in the countries that lie between the tropics, and for a good space beyond them, its visits are frequent, and its effects are anticipated. In these regions the winds vary their terrors; sometimes involving all things in a suffocating heat; sometimes mixing all the elements of fire, air, earth, and water together; sometimes, with a momentary swiftness, passing over the face of the country, and destroying all things in their passage; and sometimes raising whole sandy deserts in one country, to deposit them upon some other. We have little reason, therefore, to envy these climates the luxuriance of their soil, or the brightness of their skies. Our own muddy atmosphere, that wraps us round in obscurity, though it fails to gild our prospects with sunshine, or our groves with fruitage, nevertheless answers the call of industry. They may boast of a plentiful, but precarious harvest; while, with us, the labourer toils in a certain expectation of a moderate, but a happy return.

In Egypt,* a kingdom so noted for its fertility, and the brightness of its atmosphere during summer, the south winds are so hot, that they almost stop respiration; besides which, they are charged with such quantities of sand, that they sometimes darken the air as with a thick cloud. These sands are so fine, and driven with such violence, that they penetrate every where, even into chests, be they shut ever so closely. If these winds happen to continue for any length of time, they produce epidemic diseases, and are often followed by a great mortality. It is also found to rain but very seldom in that country; however, the want of showers is richly compensated by the copiousness of their dews, which greatly tend to promote vegetation.

In Persia, the winter begins in November, and continues till March. The cold at that time is intense enough to congeal the water; and snow falls in abundance upon their mountains. During the months of March and April, winds arise, that blow with great force, and seem to usher in the heats of summer. These return again, in autumn, with some violence; without, however, producing any dreadful effects. But, during their summer, all along the coasts of the Persian Gulf, a very dangerous wind prevails, which the natives call the *Sameyel*, still more dreadful and burning than that of Egypt, and attended with instant and fatal effects. This terrible blast, which was perhaps, the pestilence of the ancients, instantly kills all those that it involves in its passage. What its malignity consists in, none can tell, as none have ever survived its effects, to give information. It frequently, as I am told, assumes a visible form, and darts, in a kind of bluish va pour, along the surface of the country. The natives, not only of Persia, but of Arabia, talk of its effects with terror; and their poets have not failed to heighten them with the assistance of imagination. They have described it as under the conduct of a minister of vengeance, who governs its terrors, and raises, or depresses it, as he thinks proper.* These deadly winds are also known along the coasts of India, at Negapatam, Masulipatam, and Petapoli. But, luckily for mankind, the shortness of their duration diminishes the injuries that might ensue from their malignity.

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* Buffon, vol. ii. p. 258

The Cape of Good Hope, as well as many islands in the West-Indies, are famous for their hurricanes, and that extraordinary kind of cloud which is said to produce them. This cloud, which is the forerunner of an approaching hurricane, appears, when first seen, like a small black spot, on the verge of the horizon; and is called, by sailors, *the bull's eye*, from being seen so minute at a vast distance. All this time, a perfect calm reigns over the sea and land, while the cloud grows gradually broader as it approaches. At length, coming to the place where its fury is to fall, it invests the whole horizon with darkness. During all the time of its approach, a hollow murmur is heard in the cavities of the mountains; and beasts and animals, sensible of its approach, are seen running over the fields, to seek for shelter. Nothing can be more terrible than its violence when it begins. The houses in those countries, which are made of timber, the better to resist its fury, bend to the blast like osiers, and again recover their rectitude. The sun, which, but a moment before, blazed with meridian splendour, is totally shut out; and a midnight darkness prevails, except that the air is incessantly illuminated with gleams of lightning, by which one can easily see to read. The rain falls, at the same time, in torrents; and its descent has been resembled to what pours from the spouts of our houses after a violent shower. These hurricanes are not less offensive to the sense of smelling also, and never come without leaving the most noisome stench behind them. If the seamen also lay by their wet clothes, for twenty-four hours, they are all found swarming with little white maggots, that were brought with the hurricane. Our first mariners, when they visited these regions, were ignorant of its effects, and the signs of its approach; their ships, therefore, were dashed to the bottom at the first onset; and numberless were the wrecks which the hurricane occasioned. But, at present, being forewarned of its approach, they strip their masts of all their sails, and thus patiently abide its fury. These hurricanes are common in all the tropical climates. On the coasts of Guinea they have frequently three or four in a day, that thus shut out the heavens, for a little space; and, when past, leave all again in former splendour. They chiefly prevail, on that coast, in the intervals of the trade-winds; the approach of which clears the air of its meteors, and gives these mortal showers that little degree of wholesomeness which they possess. They chiefly obtain there during the months of April and May; they are known, at Loango, from January to April; on the opposite coast of Africa, the hurricane season begins in May;

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* Herbelot, Bibliotheque Oriental.

and, in general, whenever a trade-wind begins to cease, these irregular tempests are found to exert their fury.

All this is terrible:—but there is a tempest, known in those climates, more formidable than any we have hitherto been describing, which is called, by the Spaniards, a *Tornado*. As the former was seen arriving from one part of the heavens, and making a line of destruction; so the winds in this seem to blow from every quarter, and settle upon one destined place, with such fury, that nothing can resist their vehemence. When they have all met, in their central spot, then the whirlwind begins with circular rapidity. The sphere every moment widens, as it continues to turn, and catches every object that lies within its attraction. This also, like the former, is preceded by a flattering calm; the air is every where hushed, and the sea is as smooth as polished glass: however, as its effects are more dreadful than those of the ordinary hurricane, the mariner tries all the power of his skill to avoid it; which, if he fails of doing, there is the greatest danger of his going to the bottom. All along the coasts of Guinea, beginning about two degrees north of the line, and so downward, lengthwise, for about a thousand miles, and as many broad, the ocean is unnavigable, upon account of these tornadoes. In this torrid region there reigns unceasing tornadoes, or continual calms; among which, whatever ship is so unhappy as to fall, is totally deprived of all power of escaping. In this dreadful repose of all the elements, the solitary vessel is obliged to continue, without a single breeze to assist the mariner's wishes, except those whirlwinds, which only serve to increase his calamity. At present, therefore, this part of the ocean is totally avoided; and, although there may be much gold along the coasts of that part of Africa, to tempt avarice, yet there is something, much more dreadful than the fabled dragon of antiquity, to guard the treasure. As the internal parts of that country are totally unknown to travellers, from their burning sands and extensive deserts, so here we find a vast tract of ocean, lying off its shores, equally unvisited by the mariner.

But of all these terrible tempests that deform the face of nature, and repress human presumption, the sandy tempests of Arabia and Africa are the most terrible, and strike the imagination most strongly To conceive a proper idea of these, we are by no means to suppose them resembling those whirlwinds of dust that we sometimes see scattering in our air, and sprinkling their contents upon our roads or meadows. The sand-storm of Africa exhibits a very different appearance. As the sand of which the whirlwind is composed is excessively fine, and almost resembles the parts of water, its motion entirely resembles that of a fluid; and the whole plain seems to float onward, like a slow inundation. The body of sand thus rolling, is deep enough to bury houses and palaces in its bosom: travellers who are crossing those extensive deserts perceive its approach at a distance; and, in general, have time to avoid it, or turn out of its way, as it generally extends but to a moderate breadth. However, when it is extremely rapid, or very extensive, as sometimes is the case, no swiftness, no art, can avail nothing then remains, but to meet death with fortitude, and submit to be buried alive with resignation.

It is happy for us of Britain, that we have no such calamity to fear, for from this even some parts of Europe are not entirely free. We have an account given us in the History of the French Academy, of a miserable town in France, that is constantly in danger of being buried under a similar inundation; with which I will take leave to close this chapter. "In the neighbourhood of St. Paul de Leon, in Lower Brittany,* there lies a tract of country along the sea-side, which before the year 1666 was inhabited, but now lies deserted, by reason of the sands which cover it, to the height of twenty feet; and which every year advance more and more inland, and gain ground continually. From the time mentioned above, the sand has buried more than six leagues of the country inward; and it is now but half a league from the town of St. Paul; so that, in all appearance, the inhabitants must be obliged to abandon it entirely. In the country that has been overwhelmed, there are still to be seen the tops of some steeples peeping through the sand, and many chimnies that still remain above this sandy ocean. The inhabitants, however, had sufficient time to escape; but being deprived of their little all, they had no other resource but begging for their subsistence. This calamity chiefly owes its advancement to a north or an east wind, raising the sand, which is extremely fine, in such great quantities, and with such velocity, that M. Deslands, who gave the account, says, that while he was walking near the place, during a moderate breeze of wind, he was obliged, from time to time, to shake the sand from his clothes and his hat, on which it was lodged in great quantities, and made them too heavy to be easily borne. Still further, when the wind was violent, it drove the sand across a little arm of the sea, into the town of Roscoff, and covered the streets of that place two feet deep; so that they have been obliged to carry it off in carts. It may also be observed, that there are several particles of iron mixed with the sand, which are readily affected by the loadstone. The part of the coast that furnishes these sands, is a tract of about four leagues in length; and is upon a level with the sea at high-water. The shore lies in such a manner as to leave its sands subject only to the north and east winds, that bear them farther up the shore. It is easy to conceive how the same sand that has at one time been borne a short way inland, may, by some succeeding and stronger blast, be carried up much higher; and thus the whole may continue advancing forward, deluging the plain, and totally destroying its fertility. At the same time the sea, from whence this deluge of sand proceeds, may furnish it in inexhaustible quantities. This unhappy country, thus overwhelmed in so singular a manner, may well justify what the ancients and the moderns have reported concerning those tempests of sand in Africa, that are said to destroy villages, and even armies, in their bosom."

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* Histoire de l'Academie des Sciences, an. 1722.

CHAPTER XXI.

OF METEORS, AND SUCH APPEARANCES AS RESULT FROM A COMBINATION OF THE ELEMENTS.

In proportion as the substances of nature are more compounded and combined, their appearances become more inexplicable and amazing. The properties of water have been very nearly ascertained Many of the qualities of air, earth, and fire, have been discovered and estimated; but when these come to be united by nature, they often produce a result which no artificial combinations can imitate; and we stand surprised, that although we are possessed of all those substances which nature makes use of, she shows herself a much more various operator than the most skilful chymist ever appeared to be. Every cloud that moves, and every shower that falls, serves to mortify the philosopher's pride, and to show him hidden qualities in air and water, that he finds it difficult to explain. Dews, hail, snow, and thunder, are not less difficult for being more common. Indeed, when we reflect on the manner in which nature performs any one of these operations, our wonder increases. To see water, which is heavier than air, rising in air, and then falling in a form so very different from that in which it rose; to see the same fluid at one time descending in the form of hail, at another in that of snow; to see two clouds by dashing against each other, producing an electrical fire, which no watery composition that we know of can effect; these, I say, serve sufficiently to excite our wonder; and still the more, in proportion as the objects are ever pressing on our curiosity. Much, however, has been written concerning the manner in which nature operates in these productions; as nothing is so ungrateful to mankind as hopeless ignorance.

And first, with regard to the manner in which water evaporates, and rises to form clouds, much has been advanced, and many theories devised. All water,* say some, has a quantity of air mixed with it; and the heat of the sun darting down, disengages the particles of this air from the grosser fluid: the sun's rays being reflected back from the water, carry back with them those bubbles of air and water, which, being lighter than the condensed air, will ascend till they meet with a more rarefied air; and they will then stand suspended. Experience, however, proves nothing of all this. Particles of air or fire, are not thus known to ascend with a thin coat of water; and in fact we know the little particles of steam are solid drops of water. But besides this, water is known to evaporate more powerfully in the severest frost, than when the air is moderately warm.† Dr. Hamilton, therefore, of the university of Dublin, rejecting this theory, has endeavoured to establish another. According to him, as aquafortis is a menstruum that dissolves iron, and keeps it mixed in the fluid; as aquaregia is a menstruum that dissolves gold; or as water dissolves salts to a certain quantity; so air is a menstruum that corrodes and dissolves a certain quantity of water, and keeps it suspended above.

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* Spectacle de la Nature, vol. iii. † Memoires de l'Academie des Sciences, an. 1706

But however ingenious this may be, it can hardly be admitted; as we know by Mariotte's experiment,* that if water and air be inclosed together, instead of the air's acting as a menstruum upon the water, the water will act as a menstruum upon the air, and take it all up. We know also, that of two bodies, that which is most fluid and penetrating, is most likely to be the menstruum of the other; but water is more fluid and penetrating than air, and therefore the most likely of the two to be the menstruum. We know that all bodies are more speedily acted upon, the more their parts are brought into contact with the menstruum that dissolves them; but water, inclosed with compressed air, is not the more diminished thereby.† In short, we know, that cold, which diminishes the force of other menstruums, is often found to promote evaporation. In this variety of opinion and uncertainty of conjecture, I cannot avoid thinking that a theory of evaporation may be formed upon very simple and obvious principles, and embarrassed, as far as I can conceive, with very few objections.

We know that a repelling power prevails in nature, not less than an attractive one. This repulsion prevails strongly between the body of fire and that of water. If I plunge the end of a red-hot bar of iron into a vessel of water, the fluid rises, and large drops of it fly up in all manner of directions, every part bubbling and steaming until the iron be cold. Why may we not for a moment compare the rays of the sun, darted directly upon the surface of the water, to so many bars of red-hot iron, each bar indeed infinitely small, but not the less powerful? In this case, wherever a ray of fire darts, the water, from its repulsive quality, will be driven on all sides; and, of consequence, as in the case of the bar of iron, a part of it will rise. The parts thus rising, however, will be extremely small; as the ray that darts is extremely so. The assemblage of the rays darting upon the water in this manner, will cause it to rise in a light thin steam above the surface; and as the parts of this steam are extremely minute, they will be lighter than air, and consequently float upon it. There is no need for supposing them bubbles of water filled with fire; for any substance, even gold itself, will float on air, if its parts be made small enough; or, in other words, if its surface be sufficiently increased. This water, thus disengaged from the general mass, will be still farther attenuated and broken by the reflected rays, and, consequently, more adapted for ascending.

From this plain account, every appearance in evaporation may be easily deduced. The quantity of heat increases evaporation, because it raises a greater quantity of steam. The quantity of wind increases evaporation; for, by waving the surface of the water, it thus exposes a greater surface to the evaporating rays. A dry frost, in some measure, assists the quantity of evaporation; as the quantity of rays are found to be no way diminished thereby. Moist weather alone prevents evaporation; for the rays being absorbed, refracted, and broken, by the intervening moisture, before they arrive at the surface, cannot produce the effect; and the vapour will rise in a small proportion.

Thus far we have accounted for the ascent of vapours; but to account for their falling again, is attended with rather more difficulty. We have already observed, that the particles of vapour, disengaged from the surface of the water, will be broken and attenuated in their ascent, by the reflected, and even the direct rays, that happen to strike upon their minute surfaces. They will, therefore, continue to ascend, till they rise above the operation of the reflected rays, which reaches but to a certain height above the surface of the earth. Being arrived at this region, which is cold for want of reflected heat, they will be condensed, and suspended in the form of clouds. Some vapours that ascend to great heights, will be frozen into snow; others, that are condensed lower down, will put on the appearance of a mist, which we find the clouds to be, when we ascend among them, as they hang along the sides of a mountain. These clouds of snow and rain, being blown about by winds, are either entirely scattered and dispersed above. or they are still more condensed by motion, like a snow-ball, that grows more large and solid as it continues to roll. At last, therefore, they will become too weighty for the air which first raised them to sustain; and they will descend with their excess of weight, either in snow or rain. But as they will fall precipitately, when they begin to descend, the air, in some measure, will resist the falling; for as the descending fluid gathers velocity in its precipitation, the air will increase its resistance to it, and the water will, therefore, be thus broken into rain; as we see, that water which falls from the tops of houses, though it begins in a spout, separates into drops before it has got to the bottom. Were it not for this happy interposition of the air, between us and the water falling from a considerable height above us, a drop of rain might fall with dangerous force, and a hailstone might strike us with fatal rapidity.

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* Mariotte, de la Nature de l'Air, p. 97, 106.

† See Boyle's Works, vol. ii. p 619

In this manner, evaporation is produced by day; but when the sun goes down, a part of that vapour which his rays had excited, being no longer broken, and attenuated by the reflecting rays, it will become heavier than the air, even before it has reached the clouds; and it will, therefore, fall back in dews, which differ only from rain in descending before they have had time to condense it into a visible form.

Hail, the Cartesians say, is a frozen cloud, half melted, and frozen again in its descent. A hoar-frost is but a frozen dew. Lightning we know to be an electrical flash, produced by the opposition of two clouds; and thunder to be the sound proceeding from the same, continued by an echo reverberated among them. It would be to very little purpose, to attempt explaining exactly how these wonders are effected: we have as yet but little insight into the manner in which those meteors are found to operate upon each other; and, therefore, we must be contented with a detail rather of their effects than their causes.

In our own gentle climate, where nature wears the mildest and kindest aspect, every meteor seems to befriend us. With us, rains fall in refreshing showers, to enliven our fields, and to paint the landscape with a more vivid beauty. Snows cover the earth, to preserve its tender vegetables from the inclemency of the departing winter. The dews descend with such an imperceptible fall as no way injures the constitution. Even thunder itself is seldom injurious: and it is often wished for by the husbandman, to clear the air, and to kill numberless insects that are noxious to vegetation. Hail is the most injurious meteor that is known in our climate; but it seldom visits us with violence, and then its fury is but transient.

One of the most dreadful storms we hear of,* was that of Hertfordshire, in the year 1697. It began by thunder and lightning, which continued for some hours, when suddenly a black cloud came forward, against the wind, and marked its passage with devastation. The hailstones which it poured down, being measured, were found to be many of them fourteen inches round, and, consequently, as large as a bowling-green ball. Wherever it came, every plantation fell before it; it tore up the ground, split great oaks, and other trees, without number; the fields of rye were cut down, as if levelled with a scythe; wheat, oats, and barley, suffered the same damage. The inhabitants found but a precarious shelter, even in their houses, their tiles and windows being broke by the violence of the hailstones, which, by the force with which they came, seemed to have descended from a great height. The birds, in this universal wreck, vainly tried to escape by flight; pigeons, crows, rooks, and many more of the smaller and feebler kinds, were brought down. An unhappy young man, who had not time to take shelter, was killed; one of his eyes was struck out of his head, and his body was all over black with the bruises; another had just time to escape, but not without the most imminent danger, his body being bruised all over. But what is most extraordinary, all this fell within the compass of a mile

Mezeray, in his history of France, tells us of a shower of hail much more terrible, which happened in the year 1510, when the French monarch invaded Italy. There was, for a time, a horrid darkness, thicker than that of midnight, which continued till the terrors of mankind were changed to still more terrible objects, by thunder and lightning breaking the gloom, and bringing on such a shower of hail, as no history of human calamities could equal. These hailstones were of a bluish colour; and some of them weighed not less than a hundred pounds. A noisome vapour of sulphur attended the storm. All the birds and beasts of the country were entirely destroyed. Numbers of the human race suffered the same fate. But what is still more extraordinary, the fishes found no protection from their native element; but were equal sufferers in the general calamity.

These, however, are terrors that are seldom exerted in our mild climates. They only serve to mark the page of history with wonder: and stand as admonitions to mankind, of the various stores of punishment in the hands of the Deity, which his power can treasure up, and his mercy can suspend.

In the temperate zones, therefore, meteors are rarely found thus terrible; but between the tropics, and near the poles, they assume very dreadful and various appearances. In those inclement regions, where cold and heat exert their chief power, meteors seem peculiarly to have fixed their residence. They are seen there in a thousand terrifying forms, astonishing to Europeans, yet disregarded by the natives, from their frequency. The wonders of air, fire, and water, are there combined, to produce the most tremendous effects; and to sport with the labours and apprehensions of mankind. Lightnings, that flash without noise; hurricanes, that tear up the earth; clouds, that all at once pour down their contents, and produce an instant deluge; mock suns; northern lights, that illuminate half the hemisphere; circular rainbows; halos; fleeting balls of fire; clouds, reflecting back the images of things on earth, like mirrors; and water-spouts, that burst from the sea, to join with the mists that hang immediately above them. These are but a part of the phænomena that are common in those countries; and from many of which our own climate is, in a great measure, exempted.

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* Phil. Trans. vol. ii. p. 147.

The meteors of the torrid zone, are different from those that are found near the polar circles; and it may readily be supposed, that in those countries where the sun exerts the greatest force in raising vapours of all kinds, there should be the greatest quantity of meteors. Upon the approach of the winter months, as they are called, under the Line, which usually begin about May, the sky, from a fiery brightness, begins to be overcast, and the whole horizon seems wrapt in a muddy cloud. Mists and vapours still continue to rise; and the air, which so lately before was clear and elastic, now becomes humid, obscure, and stifling; the fogs become so thick, that the light of the sun seems, in a manner, excluded; nor would its presence be known, but for the intense and suffocating heat of its beams, which dart through the gloom, and, instead of dissipating, only serve to increase the mist. After this preparation, there follows an almost continual succession of thunder, rain, and tempests. During this dreadful season, the streets of cities flow like rivers; and the whole country wears the appearance of an ocean. The inhabitants often make use of this opportunity to lay in a stock of fresh water, for the rest of the year; as the same cause which pours down the deluge at one season, denies the kindly shower at another. The thunder which attends the fall of these rains, is much more terrible than that we are generally acquainted with. With us, the flash is seen at some distance, and the noise shortly after ensues; our thunder generally rolls in one quarter of the sky, and one stroke pursues another. But here it is otherwise; the whole sky seems illuminated with unremitted flashes of lightning; every part of the air seems productive of its own thunders; and every cloud produces its own shock. The strokes come so thick, that the inhabitants can scarce mark the intervals; but all is one unremitted roar of elementary confusion. It should seem, however, that the lightning of those countries is not so fatal, or so dangerous, as with us; since, in this case, the torrid zone would be uninhabitable.

When these terrors have ceased, with which, however, the natives are familiar, meteors of another kind begin to make their appearance The intense beams of the sun, darting upon stagnant waters, that generally cover the surface of the country, raise vapours of various kinds. Floating bodies of fire, which assume different names, rather from their accidental forms, than from any real difference between them, are seen without surprise. The *draco volans*, or flying dragon, as it is called; the *ignis fatuus*, or wandering fire; the *fires of St. Helmo*, or the mariner's light, are every where frequent; and of these we have numberless descriptions. "As I was riding in Jamaica," says Mr. Barbham, "one morning, from my habitation, situated about three miles north-west from Jago de la Vega, I saw a ball of fire, appearing to me of the bigness of a bomb, swiftly falling down with a great blaze. At first I thought it fell into the town; but when I came nearer, I saw many people gathered together, a little to the southward, in the savanna, to whom I rode up, to inquire the cause of their meeting they were admiring, as I found, the ground's being strangely broke up and ploughed by a ball of fire; which, as they said, fell down there. I observed there were many holes in the ground; one in the middle of the bigness of a man's head, and five or six smaller round about it, of the bigness of one's fist, and so deep as not to be fathomed by such implements as were at hand. It was observed, also, that all the green herbage was burnt up, near the holes; and there continued a strong smell of sulphur near the place, for some time after."

Ulloa gives an account of one of a similar kind, at Quito.* "About nine at night," says he, "a globe of fire appeared to rise from the side of the mountain Pichinca, and so large, that it spread a light over all the part of the city facing that mountain. The house where I lodged, looking that way, I was surprised with an extraordinary light, darting through the crevices of the window-shutters. On this appearance, and the bustle of the people in the street, I hastened to the window, and came time enough to see it in the middle of its career; which continued from west to south, till I lost sight of it, being intercepted by a mountain, that lay between me and it. It was round; and its apparent diameter about a foot. I observed it to rise from the sides of Pichinca; although to judge from its course, it was behind that mountain where this congeries of inflammable matter was kindled. In the first half of its visible course, it emitted a prodigious effulgence, then it began gradually to grow dim; so that, upon its disappearing behind the intervening mountain, its light was very faint."

Meteors, of this kind, are very frequently seen between the tropics; but they sometimes, also, visit the more temperate regions of Europe. We have the description of a very extraordinary one, given us by Montanari, that serves to shew to what great heights, in our atmosphere, these vapours are found to ascend. In the year 1676, a great globe of fire was seen at Bononia, in Italy, about three quarters of an hour after sun-set It passed westward, with a most rapid course, and at the rate of not less than a hundred and sixty miles in a minute, which is much swifter than the force of a cannon-ball, and at last stood over the Adriatic sea. In its course it crossed over all Italy; and, by computation, it could not have been less than thirty-eight miles above the surface of the earth. In the whole line of its course, wherever it approached, the inhabitants below could distinctly hear it, with a hissing noise, resembling that of a fire-work. Having passed away to sea, towards Corsica, it was heard, at last, to go off with a most violent explosion, much louder than that of a cannon;

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* Ulloa, vol. i. p. 41.

and, immediately after, another noise was heard, like the rattling of a great cart, upon a stony pavement; which was, probably, nothing more than the echo of the former sound. Its magnitude, when at Bononia, appeared twice as long as the moon, one way, and as broad the other; so that, considering its height, it could not have been less than a mile long, and half a mile broad. From the height at which this was seen, and there being no volcano on that quarter of the world from whence it came, it is more than probable that this terrible globe was kindled on some part of the contrary side of the globe, in those regions of vapours, which we have been just describing; and thus, rising above the air, and passing in a course opposite to that of the earth's motion, in this manner it acquired its amazing rapidity.

To these meteors, common enough southward, we will add one more of a very uncommon kind, which was seen by Ulloa, at Quito, in Peru; the beauty of which will, in some measure, serve to relieve us, after the description of those hideous ones preceding. "At day-break," says he, "the whole mountain of Pambamarca, where we then resided, was encompassed with very thick clouds; which the rising of the sun dispersed so far, as to leave only some vapours, too fine to be seen. On the side opposite to the rising sun, and about ten fathoms distant from the place where we were standing, we saw, as in a looking-glass, each his own image; the head being, as it were, the centre of three circular rainbows, one without the other, and just near enough o each other as that the colours of the internal verged upon those more external; while round all was a circle of white, but with a greater space between. In this manner these circles were erected, like a mirror, before us; and as we moved, they moved, in disposition and order. But, what is most remarkable, though we were six in number, every one saw the phænomenon with regard to himself, and not that relating to others. The diameter of the arches gradually altered, as the sun rose above the horizon; and the whole, after continuing a long time, insensibly faded away. In the beginning, the diameter of the inward iris, taken from its last colour, was about five degrees and a half; and that of the white arch, which surrounded the rest, was not less than sixty-seven degrees. At the beginning of the phænomenon, the arches seemed of an oval, or elliptical figure, like the disk of the sun; and afterwards became perfectly circular. Each of these was of a red colour, bordered with an orange; and the last bordered by a bright yellow, which altered into a straw-colour, and this turned to a green; but, in all, the external colour remained red." Such is the description of one of the most beautiful illusions that has ever been seen in nature. This alone seems to have combined al 'he splendours of optics in one view. To understand the manner, therefore, how this phænomenon was produced, would require a perfect knowledge of optics, which it is not our present province to enter upon. It will be sufficient, therefore, only to observe, that all these appearances arise from the density of the cloud, together with its uncommon and peculiar situation, with respect to the spectator and the sun. It may be observed, that but one of these three rainbows was real, the rest being only reflections thereof. It may also be observed, that whenever the spectator stands between the sun and a cloud of falling rain, a rainbow is seen, which is nothing more than the reflection of the different coloured rays of light from the bosom of the cloud. If, for instance, we take a glass globe, filled with water, and hang it up before us opposite the sun, in many situations it will appear transparent; but if it is raised higher, or sideways, to an angle of forty-five degrees, it will at first appear red; altered a very little higher, yellow; then green, then blue, then violet colour; in short, it will assume successively all the colours of the rainbow, but, if raised higher still, it will become transparent again. A falling shower may be considered as an infinite number of these little transparent globes, assuming different colours, by being placed at the proper heights. The rest of the shower will appear transparent; and no part of it will seem coloured, but such as are at angles of forty-five degrees from the eye, forty-five degrees upward, forty-five degrees on each side, and forty-five degrees downward, did not the plane of the earth prevent us. We therefore see only an arch of the rainbow, the lower part being cut off from our sight by the earth's interposition. However, upon the tops of very high mountains, circular rainbows are seen, because we can see to an angle of forty-five degrees downward, as well as upward, or sideways, and therefore we take in the rainbow's complete circle.

In those forlorn regions round the poles, the meteors, though of another kind, are not less numerous and alarming. When the winter begins, and the cold prepares to set in, the same misty appearance which is produced in the southern climates by the heat, is there produced by the contrary extreme.* The sea smokes like an oven, and a fog arises, which mariners call the *frost smoke.* This cutting mist commonly raises blisters on several parts of the body; and, as soon as it is wafted to some colder part of the atmosphere, it freezes to little icy particles, which are driven by the wind, and create such an intense cold on land, that the limbs of the inhabitants are sometimes frozen, and drop off.

There, also, hallos, or luminous circles round the moon, are oftener seen than in any other part of the earth, being formed by the frost smoke; although the air otherwise seems to be clear. A lunar rainbow also, is often seen there, though somewhat different from that which is common with us; as it appears of a pale white, striped with gray. In these countries also, the aurora borealis streams with peculiar lustre, and variety of colours. In Greenland it generally arises in the east, and darts its sportive fires, with variegated beauty, over the whole horizon. Its appearance is almost constant in winter; and, at those seasons when the sun departs, to return no more for half a year, this meteor kindly rises to supply its beams, and affords sufficient light for all the purposes of existence. However, in the very midst of their tedious night, the inhabitants are not entirely forsaken. The tops of the mountains are often seen painted with the red rays of the sun; and the poor Greenlander from thence begins to date his chronology. It would appear whimsical to read a Greenland calendar, in which we might be told, that one of their chiefs, having lived orty days, died, at last, of a good old age; and that his widow continued for half a day to deplore his loss, with great fidelity, before she admitted a second husband.

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* Paul Edgar's History of Greenland.

The meteors of the day, in these countries, are not less extraordinary than those of the night: mock suns are often reflected upon an opposite cloud; and the ignorant spectator fancies that there are often three or four real suns in the firmament at the same time. In this splendid appearance the real sun is always readily known by its superior brightness, every reflection being seen with diminished splendour. The solar rainbow there, is often seen different from ours. Instead of a pleasing variety of colours, it appears of a pale white, edged with a stripe of dusky yellow; the whole being reflected from the bosom of a frozen cloud.

But, of all the meteors which mock the imagination with an appearance of reality, those strange illusions that are seen there, in fine serene weather, are the most extraordinary and entertaining. "Nothing," says Krantz, "ever surprised me more, than on a fine warm summer's day, to perceive the islands that lie four leagues west of our shore, putting on a form quite different from what they are known to have. As I stood gazing upon them, they appeared at first infinitely greater than what they naturally are; and seemed as if I viewed them through a large magnifying glass. They were not thus only made larger, but brought nearer to me. I plainly descried every stone upon the land, and all the furrows filled with ice, as if I stood close by. When this illusion had lasted for a while, the prospect seemed to break up, and a new scene of wonder to present itself. The islands seemed to travel to the shore, and represented a wood, or a tall cut hedge. The scene then shifted, and showed the appearance of all sorts of curious figures; as ships with sails, streamers, and flags; antique elevated castles, with decayed turrets; and a thousand forms, for which fancy found a resemblance in nature.— When the eye had been satisfied with gazing, the whole group of riches seemed to rise in air, and at length vanish into nothing. At such times the weather is quite serene and clear; but compressed with subtle vapours, as it is in very hot weather; and these appearing between the eye and the object, give it all that variety of appearances which glasses of different refrangibilities would have done." Mr. Krantz observes, that commonly a couple of hours afterwards, a gentle west wind and a visible mist follows, which puts an end to this *lusus naturæ*.

It were easy to swell this catalogue of meteors with the names of many others, both in our own climate and in other parts of the world. Such as falling stars, which are thought to be no more than unctuous vapours, raised from the earth to small heights, and continuing to shine till that matter which first raised, and supported them, being burnt out, they fall back again to the earth, with extinguished flame. Burning spears, which are a peculiar kind of aurora borealis; bloody rains, which are said to be the excrements of an insect, that at that same has been raised into the air. Showers of stones, fishes, and ivy-berries, at first, no doubt, raised into the air by tempests in one country, and falling at some considerable distance in the manner of rain, to a tonish another. But omitting these, of which we know little more than what is thus briefly mentioned, I will conclude this chapter with the description of a water-spout; a most surprising phænomenon, not less dreadful to mariners than astonishing to the observer of nature.

These spouts are seen very commonly in the tropical seas, and sometimes in our own. Those seen by Tournefort, in the Mediterranean, he has described as follows: "The first of these," says this great botanist, "that we saw, was about a musket-shot from our ship. There we perceived the water began to boil, and to rise about a foot above its level. The water was agitated and whitish; and above its surface there seemed to stand a smoke, such as might be imagined to come from wet straw before it begins to blaze. It made a sort of a murmuring sound, like that of a torrent heard at a distance, mixed, at the same time, with a hissing noise like that of a serpent: shortly after, we perceived a column of this smoke rise up to the clouds, at the same time whirling about with great rapidity. It appeared to be as thick as one's finger; and the former sound still continued. When this disappeared, after lasting for about eight minutes, upon turning to the opposite quarter of the sky, we perceived another, which began in the manner of the former; presently after a third appeared in the west; and instantly beside it, still another arose. The most distant of these three could not be above a musket-shot from the ship. They all continued like so many heaps of wet straw set on fire, that continued to smoke, and to make the same noise as before. We soon after perceived each, with its respective canal, mounting up in the clouds, and spreading where it touched; the cloud, like the mouth of a trumpet, making a figure, to express it intelligibly, as if the tail of an animal were pulled at one end by a weight. These canals were of a whitish colour, and so tinged, as I suppose, by the water which was contained in them; for previous to this, they were apparently empty, and of the colour of transparent glass. These canals were not straight, but bent in some parts, and far from being perpendicular, but rising in their clouds with a very inclined ascent. But what is very particular, the cloud to which one of them was pointed, happening to be driven by the wind, the spout still continued to follow its motion, without being broken; and passing behind one of the others, the spouts crossed each other, in the form of a St. Andrew's Cross. In the beginning they were all about as thick as one's finger, except at the top, where they were broader, and two of them disappeared; but shortly after, the last of the three increased considerably; and its canal, which was at first so small, soon became as thick as a man's arm, then as his leg, and at last thicker than his whole body. We saw distinctly, through this transparent body, the water, which rose up with a kind of spiral motion; and it sometimes diminished a little of its thickness, and again resumed the same; sometimes widening at top, and sometimes at bottom; exactly resembling a gut filled with water, pressed with the fingers to make the fluid rise, or fall; and I am well convinced, that this alteration in the spout was caused by the wind, which pressed the cloud, and impelled it to give up its contents. After some time, its bulk was so diminished as to be no thicker than a man's arm again: and thus swelling, and diminishing, it at last became very small. In the end, I observed the sea which was raised about it, to resume its level by degrees, and the end of the canal that touched it to become as small as if it had been tied round with a cord; and this continued till the light, striking through the cloud, took away the view. I still, however, continued to look, expecting that its parts would join again, as I had before seen in one of the others, in which the spout was more than once broken, and yet again came together; but I was disappointed, for the spout appeared no more."

Many have been the solutions offered for this surprising appearance Mr. Buffon supposes the spout here described, to proceed from the operation of fire, beneath the bed of the sea; as the waters at the surface are thus seen agitated. However, the solution of Dr. Stuart is not divested of probability; who thinks it may be accounted for by suction, as in the application of a cupping-glass to the skin.

Wherever spouts of this kind are seen, they are extremely dreaded by mariners; for if they happen to fall upon a ship, they most commonly dash it to the bottom. But, if the ship be large enough to sustain the deluge, they are at least sure to destroy its sails and rigging, and render it unfit for sailing. It is said that vessels of any force usually fire their guns at them, loaden with a bar of iron; and if so happy as to strike them, the water is instantly seen to fall from them, with a dreadful noise, though without any farther mischief.

I am at a loss whether we ought to reckon these spouts called *typhons*, which are sometimes seen at land, of the same kind with those so often described by mariners at sea, as they seem to differ in several respects. That, for instance, observed at Hatfield, in Yorkshire, in 1687, as it is described by the person who saw it, seems rather to have been a whirlwind than a water-spout. The season in which it appeared was very dry, the weather extremely hot, and the air very cloudy. After the wind had blown for some time, with considerable force, and condensed the black clouds one upon another, a great whirling of the air ensued; upon which the centre of the clouds, every now and then darted down, in the shape of a thick long black pipe; in which the relator could distinctly view a motion, like that of a screw, continually screwing up to itself, as it were, whatever it happened to touch. In its progress it moved slowly over a grove of young trees, which it violently bent, in a circular motion. Going forward to a barn, it in a minute stript it of all the thatch, and filled the whole air with the same. As it came near the relator, he perceived that its blackness proceeded from a gyration of the clouds, by contrary winds, meeting in a point, or a centre; and where the greatest force was exerted, there darting down, like an Archimedes' screw, to suck up all that came in its way. Another which he saw, some time after, was attended with still more terrible effects; levelling or tearing up great oak-trees, catching up the birds in its vortex, and dashing them against the ground. In this manner it proceeded, with an audible whirling noise, like that of a mill; and at length dissolved, after having done much mischief.

But we must still continue to suspend our assent as to the nature even of these land spouts, since they have been sometimes found to drop, in a great column of water, at once upon the earth, and produce an instant inundation,* which could not readily have happened had they been caused by the gyration of a whirlwind only. Indeed, every conjecture, regarding these meteors, seems to me entirely unsatisfactory. They sometimes appear in the calmest weather at sea, of which I have been an eyewitness; and, therefore, these are not caused by a whirlwind. They are always capped by a cloud; and, therefore, are not likely to proceed from fires at the bottom. They change place; and therefore suction seems impracticable. In short, we still want facts, upon which to build a rational theory; and, instead of knowledge, we must be contented with admiration. To be well acquainted with the appearances of nature, even though we are ignorant of their causes, often constitutes the most useful wisdom.

But among all the wonders that have lately engaged the attention of the philosopher and the chymist, is the circumstance, that after the explosion of certain luminous meteors, heavy stones, varying in bulk and number, have almost constantly fallen from them to the earth. Credibility in a fact, for which not even a conjectural cause in the remotest degree probable could be assigned, was for some time suspended; but the proofs are now so numerous, and of such respectable authority, that it can no longer be doubted.

In July, 1794, about twelve stones fell near Sienna in Tuscany, as related by the Earl of Bristol. December 13, 1795, a large stone of fifty-six pounds weight, fell at Wold cottage in Yorkshire, and is described by Captain Topham. February 19, 1796, a stone of ten pounds weight fell in Portugal, an account of which is given by Mr. Southey. December 19, 1798, showers of stones fell at Benares in the East Indies, upon the testimony of J. Lloyd Williams, Esq. April 26, 1803, according to M. Fourcroy, several stones, from ten to fourteen pounds weight, fell near L'Aigle in Normandy.

Various conjectures have been made, to account for their appearance; but such is the obscurity of the subject, that no opinion in the slightest degree probable has yet been advanced. It was at first supposed, that they had been thrown out of volcanoes, but the immense distance from all volcanoes renders this opinion of little value. Chaldni endeavoured to prove, that the meteors from which they fell, were bodies floating in space, unconnected with any planetary system, attracted by the earth in their progress, and kindled by their motion in the atmosphere. Laplace suggests the probability of their having been thrown off by the volcanoes of the moon; but the meteors which almost always accompany them, and the swiftness of their horizontal motion, persuade us to reject this opinion. Sir William Hamilton, and Mr. King, with greater probability, consider them as concretions actually formed in the atmosphere. After all, we must be content to leave this phænomenon (as also the showers of sulphur and the vast masses of iron said to have fallen in South America and Siberia, and supposed to have their origin from the same causes) to the accumulated wisdom of future ages.

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* Phil. Trans. vol. iv. p. 2, 108.

CHAPTER XXII.

THE CONCLUSION.

Having thus gone through a particular description of the earth, let us now pause for a moment, to contemplate the great picture before us. The universe may be considered as the palace in which the Deity resides; and this earth as one of its apartments. In this, all the meaner races of animated nature mechanically obey him; and stand ready to execute his commands without hesitation. Man alone is found refractory; he is the only being endued with a power of contradicting these mandates. The Deity was pleased to exert superior power in creating him a superior being; a being endued with a choice of good and evil; and capable, in some measure, of co-operating with his own intentions. Man, therefore, may be considered as a limited creature, endued with powers imitative of those residing in the Deity. He is thrown into a world that stands in need of his help; and has been granted a power of producing harmony from partial confusion.

If, therefore, we consider the earth as allotted for our habitation, we shall find, that much has been given us to enjoy, and much to amend; that we have ample reasons for our gratitude, and still more for our industry. In those great outlines of nature, to which art cannot reach, and where our greatest efforts must have been ineffectual, God himself has finished these with amazing grandeur and beauty. Our beneficent Father has considered these parts of nature as peculiarly his own; as parts which no creature could have skill or strength to amend; and therefore made them incapable of alteration, or of more perfect regularity. The heavens and the firmament show the wisdom and the glory of the Workman. Astronomers, who are best skilled in the symmetry of systems, can find nothing there that they can alter for the better. God made these perfect, because no subordinate being could correct their defects.

When, therefore, we survey nature on this side, nothing can be more splendid, more correct, or amazing. We there behold a Deity residing in the midst of a universe, infinitely extended every way, animating all, and cheering the vacuity with his presence! We behold an immense and shapeless mass of matter, formed into worlds by his power, and dispersed at intervals, to which even the imagination cannot travel! In this great theatre of his glory, a thousand suns, like our own, animate their respective systems, appearing and vanishing at Divine command. We behold our own bright luminary fixed in the centre of its system, wheeling its planets in times proportioned to their distances, and at once dispensing light, heat, and action. The earth also is seen with its twofold motion; producing, by the one, the change of seasons; and by the other, the grateful vicissitudes of day and night. With what silent magnificence is all this performed! with what seeming ease! The works of art are exerted with interrupted force; and their noisy progress discovers the obstructions they receive: but the earth, with a silent steady rotation, successively presents every part of its bosom to the sun; at once imbibing nourishment and light from that parent of vegetation and fertility.

But not only provisions of heat and light are thus supplied, but its whole surface is covered with a transparent atmosphere, that turns with its motion, and guards it from external injury. The rays of the sun are thus broken into a genial warmth; and, while the surface is assisted, a gentle heat is produced in the bowels of the earth, which contributes to cover it with verdure. Waters also are supplied in healthful abundance, to support life, and assist vegetation. Mountains arise, to diversify the prospect, and give a current to the stream. Seas extend from one continent to the other, replenished with animals, that may be turned to human support; and also serving to enrich the earth with a sufficiency of vapour. Breezes fly along the surface of the fields, to promote health and vegetation. The coolness of the evening invites to rest, and the freshness of the morning renews for labour.

Such are the delights of the habitation that has been assigned to man! Without any one of these, he must have been wretched; and none of these could his own industry have supplied. But while many of his wants are thus kindly furnished on the one hand, there are numberless inconveniences to excite his industry on the other. This habitation, though provided with all the conveniences of air, pasturage, and water, is but a desert place, without human cultivation. The lowest animal finds more conveniences in the wilds of nature, than he who boasts himself their lord. The whirlwind, the inundation, and all the asperities of the air, are peculiarly terrible to man, who knows their consequences, and, at a distance, dreads their approach. The earth itself, where human art has not pervaded, puts on a frightful gloomy appearance. The forests are dark and tangled; the meadows overgrown with rank weeds; and the brooks stray without a determined channel. Nature, that has been kind to every lower order of beings, has been quite neglectful with regard to him; to the savage uncontriving man the earth is an abode of desolation, where his shelter is insufficient, and his food precarious.

A world thus furnished with advantages on one side, and inconveniences on the other, is the proper abode of reason; is the fittest to exercise the industry of a free and a thinking creature. These evils, which art can remedy, and prescience guard against, are a proper call for the exertion of his faculties; and they tend still more to assimilate him to his Creator. God beholds, with pleasure, that being which he has made, converting the wretchedness of his natural situation into a theatre of triumph; bringing all the headlong tribes of nature into subjection to his will; and producing that order and uniformity upon earth, of which his own heavenly fabric is so bright an example.

PART II.

OF ANIMALS.

CHAPTER I.

A COMPARISON OF ANIMALS WITH THE INFERIOR RANKS OF CREATION.

Having given an account of the earth in general, and the advantages and inconveniences with which it abounds, we now come to consider it more minutely. Having described the habitation, we are naturally led to inquire after the inhabitants. Amidst the infinitely different productions which the earth offers, and with which it is every where covered, animals hold the first rank; as well because of the finer formation of their parts, as of their superior power. The vegetable, which is fixed to one spot, and obliged to wait for its accidental supplies of nourishment, may be considered as the prisoner of nature. Unable to correct the disadvantages of its situation, or to shield itself from the dangers that surround it, every object that has motion, may be its destroyer.

But animals are endowed with powers of motion and defence. The greatest part are capable, by changing place, of commanding nature; and of thus obliging her to furnish that nourishment which is most agreeable to their state. Those few that are fixed on one spot, even in this seemingly helpless situation, are, nevertheless, protected from external injury by a hard shelly covering, which they often can close at pleasure, and thus defend themselves from every assault. And here, I think, we may draw the line between the animal and vegetable kingdoms. Every animal, by some means or other, finds protection from injury; either from its force, or courage, its swiftness, or cunning. Some are protected by hiding in convenient places, and others by taking refuge in a hard resisting shell. But vegetables are totally unprotected; they are exposed to every assailant, and patiently submissive in every attack. In a word, an animal is an organized being that is in some measure provided for its own security; a vegetable is destitute of every protection.

But though it is very easy, without the help of definitions, to distinguish a plant from an animal, yet both possess many properties so much alike, that the two kingdoms, as they are called, seem mixed with each other. Hence, it frequently puzzles the naturalist to tell exactly where animal life begins, and vegetative terminates; nor indeed, is it easy to resolve, whether some objects offered to view, be of the low est of the animal, or the highest of the vegetable race. The sensitive plant, that moves at the touch, seems to have as much perception as the fresh-water polypus, that is possessed of a still slower share of motion. Besides, the sensitive plant will not reproduce, upon cutting in pieces, which the polypus is known to do; so that the vegetable production seems to have the superiority. But, notwithstanding this, the polypus hunts for its food, as most other animals do. It changes its situation, and therefore possesses a power of choosing its food, or retreating from danger. Still, therefore, the animal kingdom is far removed above the vegetable; and its lowest denizen is possessed of very great privileges, when compared with the plants with which it is often surrounded.

However, both classes have many resemblances, by which they are raised above the unorganized and inert masses of nature. Minerals are mere inactive, insensible bodies, entirely motionless of themselves, and waiting some external force to alter their forms, or their properties. But it is otherwise with animals and vegetables; these are endued with life and vigour; they have their state of improvement and decay; they are capable of reproducing their kinds; they grow from seeds in some, and from cuttings in others; they seem all possessed of sensation, in a greater or less degree; they both have their enmities and affections; and as some animals are, by nature, impelled to violence, so some plants are found to exterminate all others, and make a wilderness of the places round them. As the lion makes a desert of the forest where it resides, thus no other plant will grow under the shade of the manchinel-tree. Thus, also, that plant in the West-Indies, called *caraguata*, clings round whatever tree it happens to approach: there it quickly gains the ascendant; and loading the tree with a verdure not its own, keeps away that nourishment designed to feed the trunk; and at last entirely destroys its supporter. As all animals are ultimately supported upon vegetables, so vegetables are greatly propagated, by being made a part of animal food. Birds distribute the seeds wherever they fly, and quadrupeds prune them into greater luxuriance. By these means the quantity of food, in a state of nature, is kept equal to the number of the consumers; and, lest some of the weaker ranks of animals should find nothing for their support, but all the provisions be devoured by the strong, different vegetables are appropriated to different appetites. If, transgressing this rule, the stronger ranks should invade the rights of the weak, and, breaking through all regard to appetite, should make an indiscriminate use of every vegetable, nature then punishes the transgression, and poison marks the crime as capital.

If, again, we compare vegetables and animals, with respect to the places where they are found, we shall find them bearing a still stronger similitude. The vegetables that grow in a dry and sunny soil, are strong and vigorous, though not luxuriant; so also are the animals of such a climate. Those, on the contrary, that are the joint product of heat and moisture are luxuriant and tender; and the animals assimilating to the vegetable food, on which they ultimately subsist, are much larger in such places than in others. Thus, in the internal parts of South America, and Africa, where the sun usually scorches all above, while inundations cover all below, the insects, reptiles, and other animals, grow to a prodigious size: the earth-worm of America is often a yard in length, and as thick as a walking cane; the boiguacu, which is the largest of the serpent kind, is sometimes forty feet in length; the bats, in those countries, are as big as a rabbit; the toads are bigger than a duck; and their spiders are as large as a sparrow. On the contrary, in the cold frozen regions of the north, where vegetable nature is stinted of its growth, the few animals in those climates partake of the diminution; all the wild animals, except the bear, are much smaller than in milder countries; and such of the domestic kinds as are carried thither, quickly degenerate, and grow less. Their very insects are of the minute kinds, their bees and spiders being not half so large as those in the temperate zone.

The similitude between vegetables and animals is no where more obvious than in those that belong to the ocean, where the nature of one is admirably adapted to the necessities of the other. This element, it is well known, has its vegetables, and its insects that feed upon them, in great abundance. Over many tracts of the sea, a weed is seen floating, which covers the surface, and gives the resemblance of a green and extensive meadow. On the under side of these unstable plants, millions of little animals are found, adapted to their situation. For as their ground, if I may so express it, lies over their heads, their feet are placed upon their backs; and as land animals have their legs below their bodies, these have them above. At land also, most animals are furnished with eyes to see their food; but at sea, almost all the reptile kinds are without eyes, which might only give them prospects of danger at a time when unprovided with the means of escaping it.*

Thus, in all places, we perceive an obvious similitude between the animals and the vegetables of every region. In general, however, the most perfect races have the least similitude to the vegetable productions on which they are ultimately fed; while, on the contrary, the meaner the animal, the more local it is found to be, and the more it is influenced by the varieties of the soil where it resides. Many of the more humble reptile kinds are not only confined to one country, but also to a plant; nay, even to a leaf. Upon that they subsist; increase with its vegetation, and seem to decay as it declines. They are merely the circumscribed inhabitants of a single vegetable; take them from that, and they instantly die; being entirely assimilated to the plant they feed on, assuming its colour, and even its medicinal properties. For this reason there are infinite numbers of the meaner animals that we have never an opportunity of seeing in this part of the world; they are incapable of living separate from their kindred vegetables, which grow only in a certain climate.

Such animals as are formed more perfect, lead a life of less dependence; and some kinds are found to subsist in many parts of the world at the same time. But of all the races of animated nature, man is the least affected by the soil where he resides, and least influenced by the variations of vegetable sustenance: equally unaffected by the luxuriance of the warm climates, or the sterility of the poles, he has spread his habitations over the whole earth; and finds subsistence as well amidst the ice of the north as the burning deserts under the line. All creatures of an inferior nature, as has been said, have peculiar propensities to peculiar climates; they are circumscribed to zones, and confined to territories where their proper food is found in the greatest abundance; but man may be called the animal of every climate, and suffers but very gradual alterations from the nature of any situation.

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* Linnæi Amenitates, vol. v. p. 68.

As to animals of a meaner rank, whom man compels to attend him in his migrations, these being obliged to live in a kind of constraint, and upon vegetable food often different from that of their native soil, they very soon alter their natures with the nature of their nourishment, assimilate to the vegetables upon which they feed, and thus assume very different habits as well as appearances. Thus man, unaffected himself, alters and directs the nature of other animals at his pleasure; increases their strength for his delight, or their patience for his necessities.

This power of altering the appearances of things, seems to have been given him for very wise purposes. The Deity, when he made the earth, was willing to give his favoured creature many opponents, that might at once exercise his virtues, and call forth his latent abilities. Hence we find, in those wide uncultivated wildernesses, where man, in his savage state, owns inferior strength, and the beasts claim divided dominion, that the whole forest swarms with noxious animals and vegetables; animals as yet undescribed, and vegetables which want a name. In those recesses, nature seems rather lavish than magnificent in bestowing life. The trees are usually of the largest kinds, covered round with parasite plants, and interwoven at the tops with each other. The boughs, both above and below, are peopled with various generations; some of which have never been upon the ground, and others have never stirred from the branches on which they were produced. In this manner millions of minute and loathsome creatures pursue a round of uninterrupted existence, and enjoy a life scarcely superior to vegetation. At the same time, the vegetables in those places are of the larger kinds, while the animal race is of the smaller: but man has altered this disposition of nature; having, in a great measure, levelled the extensive forests, cultivated the softer and finer vegetables, destroyed the numberless tribes of minute and noxious animals, and taken every method to increase a numerous breed of the larger kinds. He thus has exercised a severe control; unpeopled nature, to embellish it; and diminished the size of the vegetable, in order to improve that of the animal kingdom.

To subdue the earth to his own use, was, and ought to be, the aim of man; which was only to be done by increasing the number of plants, and diminishing that of animals: to multiply existence, *alone*, was that of the Deity. For this reason, we find, in a state of nature, that animal life is increased to the greatest quantity possible; and we can scarcely form a system that could add to its numbers. First, plants, or trees, are provided by nature of the largest kinds; and, consequently, the nourishing surface is thus extended. In the second place, there are animals peculiar to every part of the vegetable, so that no part of it is lost. But the greatest possible increase of life would still be deficient, were there not other animals that lived upon animals; and these are themselves, in turn, food for some other greater and stronger set of creatures. Were all animals to live upon vegetables alone, thousands would be extinct that now have existence, as the quantity of their provision would shortly fail. But, as things are wisely constructed, one animal now supports another; and thus, all take up less room than they would by living on the same food; as, to make use of a similar instance, a greater number of people may be crowded into the same space, if each is made to bear his fellow upon his shoulders.

To diminish the number of animals, and increase that of vegetables, has been the general scope of human industry; and, if we compare the utility of the kinds, with respect to man, we shall find, that of the vast variety in the animal kingdom, but very few are serviceable to him; and, in the vegetable, but very few are entirely noxious. How small a part of the insect tribes, for instance, are beneficial to mankind, and what numbers are injurious! In some countries they almost darken the air: a candle cannot be lighted without their instantly flying upon it, and putting out the flame.* The closest recesses are no safeguard from their annoyance; and the most beautiful landscapes of nature only serve to invite their rapacity. As these are injurious from their multitudes, so most of the larger kinds are equally dreadful to him from their courage and ferocity. In the most uncultivated parts of the forest these maintain an undisputed empire; and man invades their retreats with terror. These are dreadful; and there are still more which are utterly useless to him, that serve to take up the room which more beneficial creatures might possess; and incommode him rather with their numbers than their enmities. Thus, in a catalogue of land animals, that amounts to more than twenty thousand, we can scarcely reckon up a hundred that are any way useful to him; the rest being either all his open or his secret enemies, immediately attacking him in person, or intruding upon that food he has appropriated to himself. Vegetables, on the contrary, though existing in greater variety, are but few of them noxious. The most deadly poisons are often of great use in medicine; and even those plants that only seem to cumber the ground serve for food to that race of animals which he has taken into friendship, or protection. The smaller tribes of vegetables, in particular, are cultivated, as contributing either to his necessities or amusements; so that vegetable life is as much promoted by human industry, as animal life is controlled and diminished.

Hence, it was not without a long struggle, and various combinations of experience and art, that man acquired his present dominion. Almost every good that he possesses was the result of the contest; for, every day, as he was contending, he was growing more wise: and patience and fortitude were the fruits of his industry.

Hence, also, we see the necessity of some animals living upon each other, to fill up the plan of Providence; and we may, consequently infer the expediency of man's living upon all. Both animals and vegetables seem equally fitted to his appetites; and, were any religious or moral motives to restrain him from taking away life, upon any account, he would only thus give existence to a variety of beings made to prey upon each other; and, instead of preventing, multiply mutual destruction.

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* Ulloa's Description of Guayaquil.

CHAPTER II.

ON THE GENERATION OF ANIMALS

BEFORE we survey animals in their state of maturity, and performing the functions adapted to their respective natures, method requires that we should consider them in the more early periods of their existence. There has been a time when the proudest and the noblest animal was a partaker of the same imbecility with the meanest reptile; and, while yet a candidate for existence, equally helpless and contemptible. In their incipient state, all are upon a footing; the insect and the philosopher being equally insensible, clogged with matter, and unconscious of existence. Where, then, are we to begin with the history of those beings, that make such a distinguished figure in the creation? Or, where lie those peculiar characters in the parts that go to make up animated nature—that mark one animal as destined to creep in the dust, and another to glitter on the throne.

This has been a subject that has employed the curiosity of all ages, and the philosophers of every age have attempted the solution. In tracing nature to her most hidden recesses, she becomes too minute, or obscure, for our inspection; so that we find it impossible to mark her first differences, to discover the point where animal life begins, or the cause that conduces to set it in motion. We know little more than that the greatest number of animals require the concurrence of a male and female to reproduce their kind; and that these distinctly and invariable are found to beget creatures of their own species. Curiosity has, therefore, been active, in trying to discover the immediate result of this union; how far either sex contributes to the bestowing animal life, and whether it be to the male or female that we are most indebted for the privilege of our existence.

Hippocrates has supposed that fecundity proceeded from the mixture of the seminal liquor of both sexes, each of which equally contributes to the formation of the incipient animal. Aristotle, on the other hand, would have the seminal liquor in the male alone to contribute to this purpose, while the female supplied the proper nourishment for its support. Such were the opinions of these fathers of philosophy; and these continued to be adopted by the naturalists and schoolmen of succeeding ages with blind veneration. At length, Steno and Harvey, taking anatomy for their guide, gave mankind a nearer view of nature just advancing into animation. These perceived in all such animals as produced their young alive, two glandular bodies, near the womb, resembling that ovary, or cluster of small eggs, which is found in fowls; and, from the analogy between both, they gave these also the name of ovaria. These, as they resembled eggs, they naturally concluded had the same offices; and, therefore, they were induced to think that all animals, of what kind soever, were produced from eggs. At first, however, there was some altercation raised against this system: for, as these ovaria were separate from the womb, it was objected that they could not be any way instrumental in replenishing that organ, with which they did not communicate. But, upon more minute inspection, Fallopius, the anatomist, perceived two tubular vessels depending from the womb, which, like the horns of a snail, had a power of erecting themselves, of embracing the ovaria, and of receiving the eggs, in order to be fecundated by the seminal liquor. This discovery seemed, for a long time after, to fix the opinions of philosophers. The doctrine of Hippocrates was re-established, and the chief business of generation was ascribed to the female. This was for a long time the established opinion of the schools; but Leuwenhoeck, once more, shook the whole system, and produced a new schism among the lovers of speculation. Upon examining the seminal liquor of a great variety of male animals with microscopes, which helped his sight more than that of any of his predecessors; he perceived therein infinite numbers of little living creatures, like tadpoles, very brisk, and floating in the fluid with a seeming voluntary motion. Each of these, therefore, was thought to be the rudiments of an animal, similar to that from which it was produced; and this only required a reception from the female, together with proper nourishment, to complete its growth. The business of generation was now, therefore, given back to the male a second time, by many; while others suspended their assent, and chose rather to confess ignorance than to embrace error.*

In this manner has the dispute continued for several ages, some accidental discovery serving, at intervals, to renew the debate, and revive curiosity. It was a subject where speculation could find much room to display itself; and Mr. Buffon, who loved to speculate, would not omit such an opportunity of giving scope to his propensity. According to this most pleasing of all naturalists, the microscope discovers that the seminal liquor, not only of males, but of females also, abounds in these moving little animals, which have been mentioned above, and that they appear equally brisk in either fluid. These he takes not to be real animals, but organical particles, which, being simple, cannot be said to organize themselves, but go to the composition of all organized bodies whatsoever; in the same manner as a tooth in the wheel of a watch, cannot be called either a wheel, or the watch, and yet contributes to the sum of the machine. These organical particles are, according to him, diffused throughout all nature, and to be found not only in the seminal liquor, but in most other fluids in the parts of vegetables, and all parts of animated nature. As they happen, therefore, to be differently applied, they serve to constitute a part of the animal, or the vegetable, whose growth they serve to increase, while the superfluity is thrown off in the seminal liquor of both sexes, for the reproduction of other animals or vegetables of the same species. These particles assume different figures, according to the receptacle into which they enter; falling into the womb, they unite into a fœtus; beneath the bark of a tree they pullulate into branches; and, in short, the same particles that first formed the animal in the womb, contribute to increase its growth when brought forth.*

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* Bonet. Considerations sur les Corps Origines

To this system it has been objected, that it is impossible to conceive organical substances without being organized; and that, if devested of organization themselves, they could never make an organized body, as an infinity of circles could never make a triangle. It has been objected, that it is more difficult to conceive the transformation of these organical particles, than even that of the animal, whose growth we are inquiring after; and this system, therefore, attempts to explain one obscure thing by another still more obscure.

But an objection, still stronger than these, has been advanced by an ingenious countryman of our own; who asserts, that these little animals, which thus appear swimming and sporting in almost every fluid we examine with a microscope, are not real living particles, but some of the more opaque parts of the fluid, that are thus increased in size, and seem to have a much greater motion than they have in reality. For the motion being magnified with the object, the smallest degree of it will seem very considerable; and a being almost at rest may, by these means, be apparently put into violent action. Thus, for instance, if we look upon the sails of a windmill moving at a distance, they appear to go very slow; but, if we approach them, and thus magnify their bulk to our eye, they go round with great rapidity. A microscope, in the same manner, serves to bring our eye close to the object, and thus to enlarge it; and not only increase the magnitude of its parts, but of its motion. Hence therefore, it would follow, that these organical particles that are said to constitute the bulk of living nature, are but mere optical illusions; and the system founded on them must, like them, be illusive.

These, and many other objections, have been made to this system; which, instead of enlightening the mind, serve only to show, that too close a pursuit of nature very often leads to uncertainty. Happily, however, for mankind, the most intricate inquiries are generally the most useless. Instead, therefore, of balancing accounts between the sexes, and attempting to ascertain to which the business of generation most properly belongs, it will be more instructive, as well as amusing, to begin with animal nature, from its earliest retirements, and evanescent outlines, and pursue the incipient creature through all its changes in the womb, till it arrives into open day.

The usual distinction of animals, with respect to their manner of generation, has been into the oviparous and viviparous kinds; or, in other words, into those that bring forth an egg, which is afterwards hatched into life, and those that bring forth their young alive and perfect. In one of these two ways all animals were supposed to have been produced, and all other kinds of generation were supposed imaginary or erroneous. But later discoveries have taught us to be more cautious in making general conclusions, and have even induced many to doubt whether animal life may not be produced merely from putrefaction.†

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* Mr. Buffon.

† Bonet. Consid. p. 100.

Indeed, the infinite number of creatures that putrid substances seem to give birth to, and the variety of little insects seen floating in liquors, by the microscope, appear to favour this opinion. But however this may be, the former method of classing animals can now by no means be admitted, as we find many animals that are produced neither from the womb, nor from the shell, but merely from cuttings; so that to multiply life in some creatures, it is sufficient only to multiply the dissection. This being the simplest method of generation, and that in which life seems to require the smallest preparation for its existence, I will begin with it, and so proceed to the two other kinds, from the meanest to the most elaborate.

The earth-worm, the millipedes, the sea-worm, and many marine insects, may be multiplied by being cut in pieces; but the polypus is noted for its amazing fertility; and hence it will be proper to take the description. The structure of the polypus may be compared to the finger of a glove, open at one end, and closed at the other. The closed end represents the tail of the polypus, with which it serves to fix itself to any substance it happens to be upon; the open end may be compared to the mouth; and, if we conceive six or eight small strings issuing from this end, we shall have a proper idea of its arms, which it can erect, lengthen, and contract at pleasure, like the horns of a snail. This creature is very voracious, and makes use of its arms as a fisherman does of his net, to catch and entangle such little animals as happen to come within its reach. It lengthens these arms several inches, keeps them separate from each other, and thus occupies a large space in the water in which it resides. These arms, when extended, are as fine as threads of silk, and have a most exquisite degree of feeling. If a small worm happens to get within the sphere of their activity, it is quickly entangled by one of these arms, and, soon after, the other arms come to its aid: these altogether shortening, the worm is drawn into the animal's mouth, and quickly devoured, colouring the body as it is swallowed. Thus much is necessary to be observed of this animal's method of living, to show that it is not of the vegetable tribe, but a real animal, performing the functions which other animals are found to perform, and endued with powers that many of them are destitute of. But what is most extraordinary remains yet to be told; for, if examined with a microscope, there are seen several little specks, like buds, that seem to pullulate from different parts of its body; and these soon after appear to be young polypi, and like the large polypus, begin to cast their little arms about for prey, in the same manner. Whatever they happen to ensnare is devoured, and gives a colour not only to their own bodies, but to that of the parent; so that the same food is digested, and serves for the nourishment of both. The food of the little one passes into the large polypus, and colours its body; and this, in its turn, digests and swallows its food to pass into theirs. In this manner every polypus has a new colony sprouting from its body; and these new ones, even while attached to the parent animal, become parents themselves, having a smaller colony also budding from them; all, at the same time, busily employed in seeking for their prey, and the food of any one of them serving for the nourishment, and circulating through the bodies of all the rest. This society, however, is every hour dissolving; those newly produced are seen at intervals to leave the body of the large polypus, and become, shortly after, the head of a beginning colony themselves.

In this manner the polypus multiplies naturally; but one may take a much readier and shorter way to increase them, and this only by cutting them in pieces. Though cut into thousands of parts, each part still retains its vivacious quality, and each shortly becomes a distinct and a complete polypus; whether cut lengthways or crossways, it is all the same; this extraordinary creature seems a gainer by our endeavours, and multiplies by apparent destruction. The experiment has been tried, times without number, and still attended with the same success. Here, therefore, naturalists who have been blamed for the cruelty of their experiments upon living animals, may now boast of their increasing animal life, instead of destroying it. The production of the polypus is a kind of philosophical generation. The famous Sir Thomas Brown hoped one day to be able to produce children by the same method as trees are produced; the polypus is multiplied in this manner; and every philosopher may thus, if he please, boast of a very numerous, though, I should suppose, a very useless progeny.

This method of generation, from cuttings, may be considered as the most simple kind, and is a strong instance of the little pains Nature takes in the formation of her lower and humbler productions. As the removal of these from inanimate into animal existence is but small, there are but few preparations made for their journey. No organs of generation seem provided, no womb to receive, no shell to protect them in their state of transition. The little reptile is quickly fitted for all the offices of its humble sphere, and, in a very short time, arrives at the height of its contemptible perfection.

The next generation is of those animals that we see produced from the egg. In this manner all birds, most fishes, and many of the insect tribes, are brought forth. An egg may be considered as a womb, detached from the body of the parent animal, in which the embryo is but just beginning to be formed. It may be regarded as a kind of incomplete delivery, in which the animal is disburdened of its young before its perfect formation. Fishes and insects, indeed, most usually commit the care of their eggs to hazard; but birds, which are more perfectly formed, are found to hatch them into maturity by the warmth of their bodies. However, any other heat, of the same temperature, would answer the end as well; for either the warmth of the sun, or of a stove, is equally efficacious in bringing the animal in the egg to perfection. In this respect, therefore, we may consider generation from the egg as inferior to that in which the animal is brought forth alive. Nature has taken care of the viviparous animal in every stage of its existence. That force which separates it from the parent, separates it from life; and the embryo is shielded with unceasing protection till it arrives at exclusion. But it is different with the little animal in the egg; often totally neglected by the parent, and always separable from it, every accident may retard its growth, or even destroy its existence. Besides, art or accident, also, may bring this animal to a state of perfection; so that it can never be considered as a com-piece work of nature, in which so much is left for accident to finish or destroy.

But however inferior this kind of generation may be, the observation of it will afford great insight into that of nobler animals, as we can here watch the progress of the growing embryo, in every period of its existence, and catch it in those very moments when it first seems stealing into motion. Malpighi and Haller have been particularly industrious on this subject; and, with a patience almost equalling that of the sitting hen, have attended incubation in all its stages. From them, therefore, we have an amazing history of the chicken in the egg, and of its advances into complete formation.

It would be methodically tedious to describe those parts of the egg which are well known and obvious; such as its shell, its white, and its yolk; but the disposition of these is not so apparent. Immediately under the shell lies that common membrane, or skin, which lines it on the inside, adhering closely to it every where, except at the broad end, where a little cavity is left, that is filled with air, which increases as the animal within grows larger. Under this membrane are contained two whites, though seeming to us to be only one, each wrapped up in a membrane of its own, one white within the other. In the midst of all is the yolk, wrapt round likewise in its own membrane. At each end of this are two ligaments, called *chalazæ*, which are, as it were, the poles of this microcosm, being white dense substances, made from the membranes, and serving to keep the white and the yolk in their places. It was the opinion of Mr. Derham that they served also for another purpose; for a line being drawn from one ligament to the other, would not pass directly through the middle of the yolk, but rather towards one side, and would divide the yolk into two unequal parts, by which means these ligaments served to keep the smallest side of the yolk always uppermost; and in this part he supposed the cicatricula, or first speck of life, to reside; which, by being uppermost, and consequently next the hen, would be thus in the warmest situation. But this is rather fanciful than true, the incipient animal being found in all situations, and not particularly influenced by any.* The cicatricula, which is the part where the animal first begins to show signs of life, is not unlike a vetch, or a lentil, lying on one side of the yolk, and within its membrane. All these contribute to the little animal's convenience, or support; the outer membranes, and ligaments, preserve the fluids in their proper places; the white serves as nourishment; and the yolk, with its membranes, after a time, becomes a part of the animal's body.† This is the description of a hen's egg, and answers to that of all others, how large or how small soever.

Previous to putting the eggs to the hen, our philosophers first examined the cicatricula, or little spot, already mentioned; and which may be considered as the most important part of the egg. This was found, in those that were impregnated by the cock, to be large; but, in those laid without the cock, very small. It was found, by the microscope to be a kind of bag, containing a transparent liquor, in the midst of which the embryo was seen to reside. The embryo resembled a composition of little threads, which the warmth of future incubation tended to enlarge, by varying and liquifying the other fluids contained within the shell, and thus pressing them either into the pores or tubes of their substance.

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* Haller. † Ibid

Upon placing the eggs in a proper warmth,* either under the sun, or in a stove, after six hours the vital speck begins to dilate, like the pupil of the eye. The head of the chicken is instantly seen, with the back bone, something resembling a tadpole, floating in its ambient fluid, but as yet seeming to assume none of the functions of animal life. In about six hours more the little animal is seen more distinctly; the head becomes more plainly visible, and the vertebræ of the back more easily perceivable. All these signs of preparation for life are increased in six hours more: and at the end of twenty-four, the ribs begin to take their places, the neck begins to lengthen, and the head to turn to one side.

At this time,† also, the fluids in the egg seem to have changed place; the yolk, which was before in the centre of the shell, approaches nearer to the broad end. The watery part of the white is, in some measure, evaporated through the shell, and the grosser part sinks to the small end. The little animal appears to turn towards the part of the broad end, in which a cavity has been described, and with its yolk seems to adhere to the membrane there. At the end of forty hours the great work of life seems fairly begun, and the animal plainly appears to move; the back bone, which is of a whitish colour, thickens; the head is turned still more on one side; the first rudiments of the eyes begin to appear, the heart beats, and the blood begins already to circulate. The parts, however, as yet are fluid; but, by degrees, become more and more tenacious, and hardened into a kind of jelly. At the end of two days, the liquor in which the chicken swims, seems to increase; the head appears with two little bladders in the place of eyes; the heart beats in the manner of every embryo where the blood does not circulate through the lungs. In about fourteen hours after this, the chicken is grown more strong; its head, however, is still bent downwards; the veins and arteries begin to branch, in order to form the brain; and the spinal marrow is seen stretching along the back bone. In three days the whole body of the chicken appears bent; the head, with its two eye-balls, with their different humours, now distinctly appear; and five other vessels are seen, which soon unite to form the rudiments of the brain. The outlines also of the thighs and wings begin to be seen, and the body begins to gather flesh. At the end of the fourth day, the vesicles, that go to form the brain, approach each other; the wings and thighs appear more solid; the whole body is covered with a jelly-like flesh; the heart, that was hitherto exposed, is now covered up within the body, by a very thin transparent membrane; and, at the same time, the umbilical vessels, that unite the animal to the yolk, now appear to come forth from the abdomen. After the fifth and sixth days, the vessels of the brain begin to be covered over; the wings and thighs lengthen; the belly is closed up, and tumid; the liver is seen within it very distinctly, not yet grown red, but of a very dusky white; both the ventricles of the heart are discerned, as if they were two separate hearts, beating distinctly; the whole body of the animal is covered over; and the traces of the incipient feathers are already to be seen. The seventh day, the head appears very large; the brain is covered entirely over; the bill begins to appear betwixt the eyes; and the wings, the thighs, and the legs, have acquired their perfect figure.* Hitherto, however, the animal appears as if it had two bodies; the yolk is joined to it by the umbilical vessels that come from the belly, and is furnished with its vessels, through which the blood circulates, as through the rest of the body of the chicken, making a bulk greater than that of the animal itself. But towards the end of incubation, the umbilical vessels shorten the yolk, and with it the intestines are thrust up into the body of the chicken, by the action of the muscles of the belly; and the two bodies are thus formed into one. During this state, all the organs are found to perform their secretions; the bile is found to be separated, as in grown animals; but it is fluid, transparent, and without bitterness: and the chicken then also appears to have lungs. On the tenth, the muscles of the wings appear, and the feathers begin to push out. On the eleventh, the heart, which hitherto had appeared divided, begins to unite; the arteries which belong to it join into it, like the fingers into the palm of the hand. All these appearances only come more into view, because the fluids the vessels had hitherto secreted were more transparent; but as the colour of the fluids deepen, their operations and circulations are more distinctly seen. As the animal thus, by the eleventh day completely formed, begins to gather strength, it becomes more uneasy in its situation, and exerts its animal powers with increasing force. For some time before it is able to break the shell in which it is imprisoned, it is heard to chirrup, receiving a sufficient quantity of air for this purpose, from that cavity which lies between the membrane and the shell, and which must contain air to resist the external pressure. At length, upon the twentieth day, in some birds sooner, and later in others, the inclosed animal breaks the shell, within which it has been confined, with its beak; and by repeated efforts, at last procures its enlargement.

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* Malpighi. † Harvey.

From this little history we perceive, that those parts which are most conducive to life, are the first that are begun: the head and the backbone, which, no doubt, inclose the brain, and the spinal marrow, though both are too limpid to be discerned, are the first that are seen to exist; the beating of the heart is perceived soon after; the less noble parts seem to spring from these: the wings, the thighs, the feet, and lastly the bill. Whatever, therefore, the animal has double, or whatever it can live without the use of, these are latest in production. Nature first sedulously applying to the formation of the nobler organs, without which life would be of short continuance, and would be begun in vain.

The resemblance between the beginning animal in the egg, and the embry in the womb, is very striking; and this similitude has induced many to assert, that all animals are produced from eggs, in the same manner. They consider an egg excluded from the body by some. and separated into the womb by others, to be actions merely of one kind; with this only difference, that the nourishment of the one is kept within the body of the parent, and increases as the embryo happens to want the supply; the nourishment of the other is prepared all at once, and sent out with the beginning animal, as entirely sufficient for its future support. But leaving this to the discussion of anatomists, let us proceed rather with facts than dissertations; and as we have seen the progress of an oviparous animal, or one produced from the shell, let us likewise trace that of a viviparous animal, which is brought forth alive. In this investigation, Graaf has, with a degree of patience characteristic of his nation, attended the progress and increase of various animals in the womb, and minutely marked the changes they undergo. Having dissected a rabbit, half an hour after impregnation, he perceived the horns of the womb, that go to embrace and communicate with the ovary, to be more red than before; but no other change in the rest of the parts. Having dissected another, six hours after, he perceived the follicules, or the membrane covering the eggs contained in the ovary, to become reddish. In a rabbit dissected after twenty-four hours, he perceived, in one of the ovaries, three follicules, and, in the other, five, that were changed; being become, from transparent, dark and reddish. In one dissected after three days, he perceived the horns of the womb very strictly to embrace the ovaries; and he observed three of the follicules in one of them, much longer and harder than before; pursuing his inquisition, he also found two of the eggs actually separated into the horns of the womb, and each about the size of a grain of mustard-seed; these little eggs were each of them inclosed in a double membrane, the inner parts being filled with a very limpid liquor. After four days, he found, in one of the ovaries, four, and, in the other, five follicules, emptied of their eggs; and in the horns correspondent to these, he found an equal number of eggs thus separated; these eggs were now grown larger than before, and somewhat of the size of sparrow-shot. In five days, the eggs were grown to the size of duck-shot, and could be blown from the part of the womb where they were, by the breath. In seven days, these eggs were found of the size of a pistol-bullet, each covered with its double membrane, and these much more distinct than before. In nine days, having examined the liquor contained in one of these eggs, he found it, from a limpid colour, less fluid, to have got a light cloud floating upon it. In ten days, this cloud began to thicken, and to form an oblong body, of the figure of a little worm: and, in twelve days, the figure of the embryo was distinctly to be perceived, and even its parts came into view. In the region of the breast he perceived two bloody specks; and two more that appeared whitish. Fourteen days after impregnation, the head of the embryo was become large and transparent, the eyes prominent, the mouth open, and the rudiments of the ears beginning to appear; the back-bone, of a whitish colour, was bent towards the breast; the two bloody specks being now considerably increased, appeared to be nothing less than the outlines of the two ventricles of the heart: and the two whitish specks on each side, now appeared to be the rudiments of the lungs; towards the region of the belly, the liver began to be seen, of a reddish colour, and a little intricate mass, like ravel'ed thread, discerned, which soon appeared to be the stomach and the intestines; the legs soon after began to be seen, and to assume their natural positions: and from that time forth, all the parts being formed, every day only served to develope them still more, until the thirty-first day, when the rabbit brought forth her young, completely fitted for the purposes of their humble happiness.

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* Haller.

Having thus seen the stages of generation in the meaner animals, let us take a view of its progress in man; and trace the feeble beginnings of our own existence. An account of the lowliness of our own origin, if it cannot amuse, will at least serve to humble us; and it may take from our pride, though it fails to gratify our curiosity. We cannot here trace the variations of the beginning animal, as in the former instances; for the opportunities of inspection are but few and accidental: for this reason we must be content often to fill up the blanks of our history with conjecture. And, first, we are entirely ignorant of the state of the infant in the womb, immediately after conception; but we have good reason to believe that it proceeds, as in most other animals, from the egg.* Anatomists inform us, that four days after conception, there is found in the womb, an oval substance, about the size of a small pea, but longer one way than the other; this little body is formed by an extremely fine membrane, inclosing a liquor a good deal resembling the white of an egg: in this may, even then, be perceived, several small fibres, united together, which form the first rudiments of the embryo. Besides these, are seen another set of fibres, which soon after become the placenta, or that body by which the animal is supplied with nourishment.

Seven days after conception, we can readily distinguish, by the eye, the first lineaments of the child in the womb. However, they are as yet without form; showing at the end of seven days pretty much such an appearance as that of the chicken after four and twenty hours, being a small jelly-like mass, yet exhibiting the rudiments of the head; the trunk is barely visible: there likewise is to be discerned a small assemblage of fibres issuing from the body of the infant, which afterwards become the blood-vessels that convey nourishment from the placenta to the child, while inclosed in the womb.

Fifteen days after conception, the head becomes distinctly visible, and even the most prominent features of the visage begin to appear. The nose is a little elevated; there are two black specks in the place of the eyes; and two little holes, where the ears are afterwards seen. The body of the embryo also is grown larger; and, both above and below, are seen two little protuberances, which mark the places from whence the arms and thighs are to proceed. The length of the whole body, at this time, is less than half an inch.

At the end of three weeks, the body has received very little increase; but the legs and feet, with the hands and arms, are become apparent. The growth of the arms is more speedy than that of the legs; and the fingers are sooner separated than the toes. About this time the internal parts are found, upon dissection, to become distinguishable. The places of the bones are marked by small thread-like substances, that are yet more fluid even than a jelly. Among them, the ribs are distinguishable, like threads also, disposed on each side of the spine; and even the fingers and toes scarce exceed hairs in thickness.

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* The history of the child in the womb is translated from Mr. Buffon, with some alterations.

In a month the embryo is an inch long; the body is bent forward, a situation which it almost always assumes in the womb, either because a posture of this kind is the most easy, or because it takes up the least room. The human figure is now no longer doubtful: every part of the face is distinguishable; the body is skètched out; the bowels are to be distinguished as threads; the bones are still quite soft, but in some places beginning to assume a greater rigidity; the blood-vessels that go to the placenta, which, as was said, contributes to the child's nourishment, are plainly seen issuing from the navel, (being therefore called the *umbilical vessels,*) and going to spread themselves upon the placenta. According to Hippocrates, the male embryo developes sooner than the female: he adds, that at the end of thirty days, the parts of the body of the male are distinguishable; while those of the female are not equally so till ten days after.

In six weeks the embryo is grown two inches long; the human figure begins to grow every day more perfect; the head being still much larger, in proportion to the rest of the body; and the motion of the heart is perceived almost by the eye. It has been seen to beat in an embryo of fifty days old, a long time after it had been taken out of the womb.

In two months the embryo is more than two inches in length. The ossification is perceivable in the arms and thighs, and in the point of the chin, the under jaw being greatly advanced before the upper. These parts, however, may as yet be considered as bony points, rather than as bones. The umbilical vessels, which before went side by side, are now begun to be twisted, like a rope, one over the other, and go to join with the placenta, which, as yet, is but small.

In three months the embryo is above three inches long, and weighs about three ounces. Hippocrates observes, that not till then the mother perceives the child's motion; and he adds, that in female children, the motion is not observable till the end of four months. However, this is no general rule, as there are women who assert that they perceived themselves to be quick with child, as their expression is, at the end of two months; so that this quickness seems rather to arise from the proportion between the child's strength, and the mother's sensibility, than from any determinate period of time. At all times, however, the child is equally alive; and, consequently, those juries of matrons that are to determine upon the pregnancy of criminals, should not inquire whether the woman be quick, but whether she be with child; if the latter be perceivable, the former follows of course.

Four months and a half after conception, the embryo is from six to seven inches long. All the parts are so augmented, that even their proportions are now distinguishable. The very nails begin to appear upon the fingers and toes; and the stomach and intestines already begin to perform their functions of receiving and digesting. In the stomach is found a liquor similar to that in which the embryo floats; in one part of the intestines, a milky substance; and in the other, an excrementitious. There is found also a small quantity of bile in the gall bladder; and some urine in its own proper receptacle. By this time also, the posture of the embryo seems to be determined. The head is bent forward, so that the chin seems to rest upon its breast; the knees are raised up towards the head, and the legs bent backward, somewhat resembling the posture of those who sit on their haunches. Sometimes the knees are raised so high as to touch the cheeks, and the feet are crossed over each other; the arms are laid upon the breast, while one of the hands, and often both, touch the visage; sometimes the hands are shut, and sometimes also the arms are found hanging down by the body. These are the most usual postures which the embryo assumes; but these it is frequently known to change; and it is owing to these alterations that the mother so frequently feels those twitches which are usually attended with pain.

The embryo, thus situated, is furnished by nature with all things proper for its support; and, as it increases in size, its nourishment also is found to increase with it. As soon as it first begins to grow in the womb, that receptacle, from being very small, grows larger; and, what is more surprising, thicker every day. The sides of a bladder, as we know, the more they are distended, the more they become thin. But here the larger the womb grows, the more it appears to thicken. Within this the embryo is still farther involved, in two membranes, called the *chorion* and *amnios;* and floats in a thin transparent fluid, upon which it seems, in some measure, to subsist. However, the great storehouse, from whence its chief nourishment is supplied, is called the *placenta;* a red substance somewhat resembling a sponge, that adheres to the inside of the womb, and communicates, by the umbilical vessels, with the embryo. These umbilical vessels, which consist of a vein and two arteries, issue from the navel of the child, and are branched out upon the placenta; where they, in fact, seem to form its substance; and, if I may so express it, to suck up their nourishment from the womb, and the fluids contained therein. The blood thus received from the womb, by the placenta, and communicated by the umbilical vein to the body of the embryo, is conveyed to the heart; where, without ever passing into the lungs, as in the born infant, it takes a shorter course; for entering the right auricle of the heart, instead of passing up into the pulmonary artery, it seems to break this partition, and goes directly through the body of the heart, by an opening called the *foramen ovale*, and from thence to the aorta, or great artery; by which it is driven into all parts of the body. Thus we see the placenta, in some measure, supplying the place of lungs; for as the little animal can receive no air by inspiration, the lungs are therefore useless. But we see the placenta converting the fluid of the womb into blood, and sending it, by the umbilical vein, to the heart: from whence it is dispatched by a quicker and shorter circulation through the whole frame

In this manner the embryo reposes in the womb; supplied with that nourishment which is fitted to its necessities, and furnished with those organs that are adapted to its situation. As its sensations are but few, its wants are in the same proportion; and it is probable that a sleep, with scarce any intervals, marks the earliest period of human life. As the little creature, however, gathers strength and size, it seems to become more wakeful and uneasy; even in the womb it begins to feel the want of something it does not possess; a sensation that seems coeval with man's nature, and never leaves him till he dies. The embryo even then begins to struggle for a state more marked by pleasure and pain, and, from about the sixth month, begins to give the mother warning of the greater pain she is yet to endure. The continuation of pregnancy in woman is usually nine months, but there have been many instances when the child has lived that was born at seven; and some are found to continue pregnant a month above the usual time. When the appointed time approaches, the infant, that has for some months been giving painful proofs of its existence, now begins to increase its efforts for liberty. The head is applied downwards, to the aperture of the womb, and by reiterated efforts it endeavours to extend the same: these endeavours produce the pain, which all women in labour feel in some degree; those of strong constitutions the least, those most weakly the most severely; since we learn, that the women of Africa always deliver themselves, and are well a few hours after; while those of Europe require assistance, and recover more slowly. Thus the infant, still continuing to push with its head forward, by the repetition of its endeavours, at last succeeds, and issues into life. The blood, which had hitherto passed through the heart, now takes a wider circuit; and the foramen ovale closes; the lungs, that had till this time been inactive, now first begin their functions; the air rushes in to distend them; and this produces the first sensation of pain, which the infant expresses by a shriek: so that the beginning of our lives, as well as the end, is marked with anguish.*

From comparing these accounts, we perceive that the most laboured generation is the most perfect; and that the animal, which, in proportion to its bulk, takes the longest time for production, is always the most complete when finished. Of all others, man seems the slowest in coming into life, as he is the slowest in coming to perfection; other animals of the same bulk, seldom remain in the womb above six months, while he continues nine; and even after his birth, appears more than any other to have his state of imbecility prolonged.

We may observe also, that that generation is the most complete, in which the fewest animals are produced: Nature, by attending to the production of one at a time, seems to exert all her efforts in bringing it to perfection; but, where this attention is divided, the animals so produced come into the world with partial advantages. In this manner twins are never, at least while infants, so large, or so strong, as those that come singly into the world; each having, in some measure, robbed the other of its right; as that support, which Nature meant for one, has been prodigally divided.

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* Bonet. Contemplat. de la Nature, vol. i. p 212

In this manner, as those animals are the best that are produced singly, so we find that the noblest animals are ever the least fruitful. These are seen usually to bring forth but one at a time, and to place all their attention upon that alone. On the other hand, all the oviparous kinds produce an amazing plenty; and even the lower tribes of viviparous animals increase in a seeming proportion to their minuteness and imperfection. Nature seems lavish of life in the lower orders of the creation; and, as if she meant them entirely for the use of the nobler races, she appears to have bestowed greater pains in multiplying the number than in completing the kind. In this manner, while the elephant and the horse bring forth but one at a time, the spider and the beetle are seen to produce a thousand; and even among the smaller quadrupeds, all the inferior kinds are extremely fertile; any one of these being found, in a very few months, to become the parent of a numerous progeny.

In this manner, therefore, the smallest animals multiply in the greatest proportion; and we have reason to thank Providence that the most formidable animals are the least fruitful. Had the lion and the tiger the same degree of fecundity with the rabbit or the rat, all the arts of man would be unable to oppose these fierce invaders; and we should soon perceive them become the tyrants of those who claim the lordship of the creation. But Heaven, in this respect, has wisely consulted the advantage of all. It has opposed to man only such enemies as he has art and strength to conquer; and as large animals require proportional supplies, nature was unwilling to give new life, where it, in some measure, denied the necessary means of subsistence.

In consequence of this pre-established order, the animals that are endowed with the most perfect methods of generation, and bring forth but one at a time, seldom begin to procreate till they have almost acquired their full growth. On the other hand, those which bring forth many, engender before they have arrived at half their natural size. The horse and the bull come almost to perfection before they begin to generate; the hog and the rabbit scarcely leave the teat before they become parents themselves. In whatever light, therefore, we consider this subject, we shall find that all creatures approach most to perfection, whose generation most nearly resembles that of man. The reptile produced from cutting is but one degree above the vegetable. The animal produced from the egg is a step higher in the scale of existence; that class of animals which are brought forth alive, are still more exalted. Of these, such as bring forth one at a time are the most complete: and the foremost of these stands Man, *the great master of all*, who seems to have united the perfections of all the rest in his formation.

CHAPTER III.

THE INFANCY OF MAN.

When we take a survey of the various classes of animals, and examine their strength, their beauty, or their structure, we shall find man to possess most of those advantages united, which the rest enjoy partially. Infinitely superior to all others in the powers of the understanding, he is also superior to them in the fitness and proportions of his form. He would, indeed, have been one of the most miserable beings upon earth, if with a sentient mind he was so formed as to be incapable of obeying its impulse; but Nature has otherwise provided; as with the most extensive intellects to command, she has furnished him with a body the best fitted for obedience.

In infancy,* however, that mind and this body form the most helpless union in all animated nature; and, if any thing can give us a picture of complete imbecility, it is a man when just come into the world. The infant just born stands in need of all things, without the power of procuring any. The lower races of animals, upon being produced, are active, vigorous, and capable of self-support; but the infant is obliged to wait in helpless expectation; and its cries are its only aid to procure subsistence.

An infant just born may be said to come from one element into another: for, from the watery fluid in which it was surrounded, it now immerges into air; and its first cries seem to imply how greatly it regrets the change. How much longer it could have continued in a state of almost total insensibility in the womb, is impossible to tell: but it is very probable that it could remain there some hours more. In order to throw some light upon this subject, Mr. Buffon so placed a pregnant bitch, as that her puppies were brought forth in warm water, in which he kept them above half an hour at a time. However, he saw no change in the animals thus newly brought forth; they continued the whole time vigorous; and, during the whole time, it is very probable that the blood circulated through the same channels through which it passed while they continued in the womb.

Almost all animals have their eyes closed,† for some days after being brought into the world. The infant opens them the instant of its birth. However, it seems to keep them fixed and idle; they want that lustre which they acquire by degrees; and if they happen to move, it is rather an accidental gaze than an exertion of the act of seeing. The light alone seems to make the greatest impression upon them. The eyes of infants are sometimes found turned to the place where it is strongest; and the pupil is seen to dilate and diminish, as in grown persons, in proportion to the quantity it receives. But still the infant is incapable of distinguishing objects; the sense of seeing, like the rest of the senses, requires a habit before it becomes any way serviceable. All the senses must be compared with each other, and must be made to correct the defects of one another, before they can give just information. It is probable, therefore, that if the infant could express its own sensations, it would give a very extraordinary description of the illusions which it suffers from them. The sight might, perhaps, be represented as inverting objects, or multiplying them; the hearing, instead of conveying one uniform tone, might be said to bring up an interrupted succession of noises; and the touch apparently would divide one body into as many as there are fingers that grasped it. But all these errors are lost in one confused idea of existence; and it is happy for the infant that it can then make but very little use of its senses, when they could serve only to bring it false information.

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* Buffon, vol. iv. p. 173.

† Buffon, vol. iv p. 173.

If there be any distinct sensations, those of pain seem to be much more frequent and stronger than those of pleasure. The infant's cries are sufficient indications of the uneasiness it must, at every interval, endure; while, in the beginning, it has got no external marks to testify its satisfactions. It is not till after forty days that it is seen to smile; and not till that time also, that tears begin to appear, its former expressions of uneasiness being always without them. As to any other marks of the passions, the infant being as yet almost without them, it can express none of them in its visage; which, except in the act of crying and laughing, is fixed in a settled serenity. All the other parts of the body seem equally relaxed and feeble: its motions are uncertain, and its postures without choice; it is unable to stand upright; its hams are yet bent, from the habit which it received from its position in the womb; it has not strength enough in its arms to stretch them forward, much less to grasp any thing with its hands; it rests just in the posture it is laid; and, if abandoned, must continue in the same position.

Nevertheless, though this be the description of infancy among mankind in general, there are countries and races among whom infancy does not seem marked with such utter imbecility, but where the children, not long after they are born, appear possessed of a greater share of self-support. The children of negroes have a surprising degree of this premature industry: they are able to walk at two months; or, at least, to move from one place to another: they also hang to the mother's back without any assistance, and seize the breast over her shoulder; continuing in this posture till she thinks proper to lay them down. This is very different in the children of our countries, that seldom are able to walk under a twelvemonth.

The skin of children newly brought forth is always red, proceeding from its transparency, by which the blood beneath appears more conspicuous. Some say that this redness is greatest in those children that are afterwards about to have the finest complexions; and it appears reasonable that it should be so, since the thinnest skins are always the fairest. The size of a new-born infant is generally about twenty inches, and its weight about twelve pounds. The head is large, and all the members delicate, soft, and puffy. These appearances alter with its age; as it grows older, the head becomes less in proportion to the rest of the body; the flesh hardens; the bones, that before birth grew very thick in proportion, now lengthen by degrees, and the human figure more and more acquires its due dimensions. In such children, however, as are but feeble or sickly, the head always continues too big for the body; the heads of dwarfs being extremely large in proportion.

Infants, when newly born, pass most of their time in sleeping, and awake with crying, excited either by sensations of pain or of hunger. Man, when come to maturity, but rarely feels the want of food; eating twice or thrice in the four and twenty hours is known to suffice the most voracious: but the infant may be considered as a little glut ton, whose only pleasure consists in its appetite; and this, except when it sleeps, it is never easy without satisfying Thus nature has adapted different desires to the different periods of life; each as it seems most necessary for human support or succession. While the animal is yet forming, hunger excites it to that supply which is necessary for its growth; when it is completely formed, a different appetite takes place, that incites it to communicate existence.—These two desires take up the whole attention at different periods, but are very seldom found to prevail strongly together in the same age; one pleasure ever serving to repress the other: and, if we find a person of full age, placing a principal part of his happiness in the nature and quantity of his food, we have strong reasons to suspect, that with respect to his other appetites, he still retains a part of the imbecility of his childhood.

It is extraordinary, however, that infants, who are thus more voracious than grown persons, are nevertheless more capable of sustaining hunger. We have several instances, in accidental cases of famine, in which the child has been known to survive the parent, and seen clinging to the breast of its dead mother. Their little bodies also, are more patient of cold; and we have similar instances of the mother's perishing in the snow, while the infant has been found alive beside her. However, if we examine the internal structure of infants, we shall find an obvious reason for both these advantages. Their blood-vessels are known to be much larger than in adults; and their nerves much thicker and softer: thus being furnished with a more copious quantity of juices, both of the nervous and sanguinary kinds, the infant finds a temporary sustenance in this superfluity, and does not expire till both are exhausted. The circulation also being larger and quicker, supplies it with proportionable warmth, so that it is more capable of resisting the accidental rigours of the weather.

The first nourishment of infants is well known to be the mother's milk; and, what is remarkable, the infant has milk in its own breasts, which may be squeezed out by compression: this nourishment becomes less grateful as the child gathers strength; and perhaps, also, more unwholesome. However, in cold countries, which are unfavourable to propagation, and where the female has seldom above three or four children at the most, during her life, she continues to suckle the child for four or five years together. In this manner the mothers of Canada and Greenland are often seen suckling two or three children, of different ages, at a time.

The life of infants is very precarious, till the age of three or four, from which time it becomes more secure; and when a child arrives at its seventh year, it is then considered as a more certain life, as Mr. Buffon asserts, than at any other age whatever. It appears, from Simpson's Tables, that of a certain number of children born at the same time, a fourth part are found dead at the end of the first year; more than one-third at the end of the second; and at least half at the end of the third; so that those who live to be above three years old, are indulged a longer term than half the rest of their fellow creatures. Nevertheless, life, at that period, may be considered as mere animal existence; and rather a preparation for, than an enjoyment of, those satisfactions, both of mind and body, that make life of real value: and hence it is more natural for mankind to deplore a fellow-creature, cut off in the bloom of life, than one dying in early infancy. The one, by living up to youth, and thus wading through the disadvantageous parts of existence, seems to have earned a short continuance of its enjoyments: the infant, on the contrary, has served but a short apprenticeship to pain; and, when taken away, may be considered as rescued from a long continuance of misery.

There is something very remarkable in the growth of the human body.* The embryo in the womb continues to increase still more and more till it is born. On the other hand, the child's growth is less every year, till the time of puberty, when it seems to start up of a sudden. Thus, for instance, the embryo, which is an inch long in the first month, grows but one inch and a quarter in the second; it then grows one and a half in the third; two and a half in the fourth; and in this manner it keep increasing, till in the last month of its continuance it is actually found to grow four inches; and, in the whole, about eighteen inches long. But it is otherwise with the child when born; if we suppose it eighteen inches at that time, it grows in the first year six or seven inches; in the second year, it grows but four inches; in the third year, about three; and so on, at the rate of about an inch and a half, or two inches, each year, till the time of puberty, when nature seems to make one great last effort, to complete her work, and unfold the whole animal machine.

The growth of the mind in children seems to correspond with that of the body. The comparative progress of the understanding is greater in infants than in children of three or four years old. If we only reflect a moment on the amazing acquisitions that an infant makes in the first and second years of life, we shall have much cause for wonder. Being sent into a world where every thing is new and unknown, the first months of life are spent in a kind of torpid amazement; an attention distracted by the multiplicity of objects that press to be known. The first labour, therefore, of the little learner is, to correct the illusions of the senses, to distinguish one object from another, and to exert the memory, so as to know them again. In this manner a child of a year old has already made a thousand experiments; all which it has properly ranged, and distinctly remembers. Light, heat, fire, sweets, and bitters, sounds soft or terrible, are all distinguished at the end of a very few months. Besides this, every person the child knows, every individual object it becomes fond of, its rattles, or its bells, may be all considered as so many new lessons to the young mind, with which it has not become acquainted, without repeated exertions of the understanding. At this period of life, the knowledge of every individual object cannot be acquired without the same effort which, when grown up, is employed upon the most abstract idea: every thing the child hears or sees, all the marks and characters of nature, are as much unknown, and require the same attention to attain, as if the reader were set to understand the characters of an Ethiopic manuscript; and yet we are in how short a time the little student begins to understand them all, and to give evident marks of early industry.

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* Buffon, vol. iv. p. 171.

It is very amusing to pursue the young mind, while employed in its first attainments. At about a year old the same necessities that first engaged its faculties, increase as its acquaintance with nature enlarges. Its studies, therefore, if I may use the expression, are no way relaxed; for having experienced what gave pleasure at one time, it desires a repetition of it from the same object; and, in order to obtain this, that object must be pointed out; here, therefore, a new necessity arises, which, very often, neither its little arts nor importunities can remove; so that the child is at last obliged to set about naming the objects it desires to possess or avoid. In beginning to speak, which is usually about a year old, children find a thousand difficulties. It is not without repeated trials that they come to pronounce any one of the letters; nor without an effort of the memory, that they can retain them. For this reason, we frequently see them attempting a sound which they had learned, but forgot; and when they have failed, I have often seen their attempts attended with apparent confusion. The letters soonest learned, are those which are most easily formed; thus A and B require an obvious disposition of the organs, and their pronunciation is consequently soon attained. Z and R, which require a more complicated position, are learned with greater difficulty. And this may, perhaps, be the reason why the children in some countries speak sooner than in others; for the letters mostly occurring in the language of one country, being such as are of easy pronunciation, that language is of course more easily attained. In this manner the children of the Italians are said to speak sooner than those of the Germans, the language of the one being smooth and open; that of the other, crowded with consonants, and extremely guttural.

But be this as it will, in all countries children are found able to express the greatest part of their wants by the time they arrive at two years old; and from the moment the necessity of learning new words ceases, they relax their industry. It is then that the mind, like the body, seems every year to make slow advances; and, in order to spur up attention, many systems of education have been contrived.

Almost every philosopher who has written on the education of children, has been willing to point out a method of his own, chiefly professing to advance the health, and improve the intellects at the same time. These are usually found to begin with finding nothing right in the common practice, and by urging a total reformation. In consequence of this, nothing can be more wild or imaginary than their various systems of improvement. Some will have the children every day plunged in cold water, in order to strengthen their bodies; they will have them converse with the servants in nothing but the Latin language, in order to strengthen their minds; every hour of the day must be appointed for its own studies, and the child must learn to make these very studies an amusement; till about the age of ten or eleven it becomes a prodigy of premature improvement. Quite opposite to this, we have others, whom the courtesy of mankind also calls *philosophers*: and they will have the child learn nothing till the age of ten or eleven, at which the former has attained so much perfection; with them the mind is to be kept empty, until it has a proper distinction of some metaphysical ideas about truth, and the promising pupil is debarred the use of even his own faculties, lest they should conduct him into prejudice and error. In this manner some men whom fashion has celebrated for profound and fine thinkers, have given their hazarded and untried conjectures, upon one of the most important subjects in the world, and the most interesting to humanity. When men speculate at liberty upon innate ideas, or the abstracted distinctions between will and power, they may be permitted to enjoy their systems at pleasure, as they are harmless, although they may be wrong; but when they allege that children are to be every day plunged in cold water, and, whatever be their constitutions, indiscriminately inured to cold and moisture; that they are to be kept wet in the feet, to prevent their catching cold; and never to be corrected when young, for fear of breaking their spirits when old; these are such noxious errors, that all reasonable men should endeavour to oppose them. Many have been the children whom these opinions, begun in speculation, have injured or destroyed in practice; and I have seen many a little philosophical martyr, whom I wished, but was unable to relieve.

If any system be therefore necessary, it is one that would serve to show a very plain point; that very little system is necessary. The natural and common course of education is in every respect the best: I mean that in which the child is permitted to play among its little equals, from whose similar instructions it often gains the most useful stores of knowledge. A child is not idle because it is playing about the fields, or pursuing a butterfly; it is all this time storing its mind with objects upon the nature, the properties, and the relations of which future curiosity may speculate.

I have ever found it a vain task to try to make a child's learning its amusement; nor do I see what good end it would answer were it actually attained. The child, as was said, ought to have its share of play, and it will be benefited thereby; and for every reason also it ought to have its share of labour. The mind, by early labour, will be thus accustomed to fatigues and subordination; and whatever be the person's future employment in life, he will be better fitted to endure it: he will be thus enabled to support the drudgeries of office with content; or to fill up the vacancies of life with variety. The child, therefore, should by times be put to its duty; and be taught to know, that the task is to be done, or the punishment to be endured. I do not object against alluring it to duty by reward; but we well know that the mind will become more strongly stimulated by pain; and both may, upon some occasions, take their turn to operate. In this manner, a child, by playing with its equals abroad, and labouring with them at school, will acquire more health and knowledge, than by being bred up under the wing of any speculative system-maker; and will be thus qualified for a life of activity and obedience. It is true indeed, that when educated in this manner, the boy may not be so seemingly sensible and forward as one bred up under solitary instruction; and, perhaps, this early forwardness is more engaging than useful. It is well known that many of those children who have been such prodigies of literature before ten, have not made an adequate progress to twenty. It should seem that they only began learning manly things before their time; and, while others were busied in picking up that knowledge adapted to their age and curiosity, these were forced upon subjects unsuited to their years: and, upon that account alone, appearing extraordinary. The stock of knowledge in both may be equal, but with this difference, that each is yet to learn what the other knows.

But whatever may have been the acquisitions of children at ten or twelve, their greatest and most rapid progress is made when they arrive near the age of puberty. It is then that all the powers of nature seem at work in strengthening the mind and completing the body; the youth acquires courage, and the virgin modesty; the mind, with new sensations, assumes new powers; it conceives with greater force, and remembers with greater tenacity. About this time, therefore, which is various in different countries, more is learned in one year than in any two of the preceding; and on this age in particular, the greatest weight of instruction ought to be thrown.

CHAPTER IV.

OF PUBERTY.

It has been often said, that the season of youth is the season of pleasures: but this can only be true in savage countries, where but little preparation is made for the perfection of human nature, and where the mind has but a very small part in the enjoyment. It is otherwise in those places where nature is carried to the highest pitch of refinement, in which this season of the greatest sensual delight is wisely made subservient to the succeeding, and more rational one of manhood. Youth, with us, is but a scene of preparation; a drama, upon the right conduct of which all future happiness is to depend. The youth who follows his appetites, too soon seizes the cup, before it has received its best ingredients; and, by anticipating his pleasures, robs the remaining parts of life of their share; so that his eagerness only produces a manhood of imbecility, and an age of pain.

The time of puberty is different in various countries, and always more late in men than in women. In the warm countries of India, the women are marriageable at nine or ten, and the men at twelve or thirteen. It is also different in cities, where the inhabitants lead a more soft, luxurious life, from the country, where they work harder, and fare less delicately. Its symptoms are seldom alike in different persons; but it is usually known by a swelling of the breasts in one sex, and a roughness of the voice in the other. At this season, also, the women seem to acquire new beauty, while the men lose all that delicate effeminacy of countenance which they had when boys.

All countries, in proportion as they are civilized or barbarous, improve or degrade the nuptial satisfaction. In those miserable regions, where strength makes the only law, the stronger sex exerts its power, and becomes the tyrant over the weaker: while the inhabitant of Negroland is indolently taking his pleasure in the fields, his wife is obliged to till the grounds that serve for their mutual support. It is thus in all barbarous countries, where the men throw all the laborious duties of life upon the women; and, regardless of beauty, put the softer sex to those employments that must effectually destroy it.

But in countries that are half barbarous, particularly wherever Mahometanism prevails, the men run into the very opposite extreme Equally brutal with the former, they exert their tyranny over the weaker sex, and consider that half of the human creation as merely made to be subservient to the depraved desires of the other. The chief, and indeed the only aim of an Asiatic, is to be possessed of many women; and to be able to furnish a seraglio is the only tendency of his ambition. As the savage was totally regardless of beauty, he, on the contrary, prizes it too highly; he excludes the person who is possessed of such personal attractions from any share in the duties or employments of life; and, as if willing to engross all beauty to himself, increases the number of his captives in proportion to the progress of his fortune. In this manner he vainly expects to augment his satisfactions, by seeking from many that happiness which he ought to look for in the society of one alone. He lives a gloomy tyrant, amidst wretches of his own making; he feels none of those endearments which spring from affection, none of those delicacies which arise from knowledge. His mistresses, being shut out from the world, and totally ignorant of all that passes there, have no arts to entertain his mind, or calm his anxieties; the day passes with them in sullen silence, or languid repose; appetite can furnish but few opportunities of varying the scene: and all that falls beyond it must be irksome expectation.

From this avarice of women, if I may be allowed to express it so, has proceeded that jealousy and suspicion which ever attends the miser: hence those low and barbarous methods of keeping the women of those countries guarded, and of making and procuring eunuchs to attend them. These unhappy creatures are of two kinds, the white and the black. The white are generally made in the country where they reside, being but partly deprived of the marks of virility; the black are generally brought from the interior parts of Africa, and are made entirely bare. These are chiefly chosen for their deformity; the thicker the lips, the flatter the nose, and the more black the teeth, the more valuable the eunuch; so that the vile jealousy of mankind here inverts the order of nature, and the poor wretch finds himself valued in proportion to his deficiencies. In Italy, where this barbarous custom is still retained, and eunuchs are made in order to improve the voice, the laws are severely aimed against such practice; so that being entirely prohibited, none but the poorest and most abandoned of the people still secretly practise it upon their children. Of those served in this manner, not one in ten is found to become a singer; but such is the luxurious folly of the times, that the success of one amply compensates for the failure of the rest. It is very difficult to account for the alterations which castration makes in the voice, and the other parts of the body. The eunuch is shaped differently from others. His legs are of an equal thickness above and below; his knees weak; his shoulders narrow; and his beard thin and downy. In this manner his person is rendered more deformed; but his desires, as I am told, still continue the same; and actually, in Asia, some of them are found to have their seraglios, as well as their masters. Even in our country, we have an instance of a very fine woman's being married to one of them, whose appearance was the most unpromising; and what is more extraordinary still, I am told, that this couple continue perfectly happy in each other's society.

The mere necessities of life seem the only aim of the savage; the sensual pleasures are the only study of the semi-barbarian; but the refinement of sensuality, by reason, is the boast of real politeness. Among the merely barbarous nations, such as the natives of Madagascar, or the inhabitants of Congo, nothing is desired so ardently as to prostitute their wives or daughters to strangers, for the most trifling advantages; they will account it a dishonour not to be among the foremost who are thus received into favour: on the other hand, the Mahometan keeps his wife faithful by confining her person, and would instantly put her to death if he but suspected her chastity. With the politer inhabitants of Europe, both these barbarous extremes are avoided; the woman's person is left free, and no constraint is imposed but upon her affections. The passion of love, which may be considered as the nice conduct of ruder desire, is only known and practised in this part of the world; so that what other nations guard as their right, the more delicate European is contented to ask as a favour. In this manner the concurrence of mutual appetite contributes to increase mutual satisfaction; and the power on one side of refusing, makes every blessing more grateful when obtained by the other. In barbarous countries, woman is considered merely as a useful slave; in such as are somewhat more refined, she is regarded as a desirable toy; in countries entirely polished, she enjoys juster privileges; the wife being considered as a useful friend, and an agreeable mistress. Her mind is still more prized than her person; and without the improvement of both, she can never expect to become truly agreeable; for her good sense alone can preserve what she has gained by her beauty.

Female beauty, as was said, is always seen to improve about the age of puberty; but if we should attempt to define in what this beauty consists, or what constitutes its perfection, we should find nothing more difficult to determine. Every country has its peculiar way of thinking, in this respect; and even the same country thinks differently at different times. The ancients had a very different taste from what prevails at present. The eye-brows joining in the middle was considered as a very peculiar grace by Tibullus, in the enumeration of the charms of his mistress. Narrow foreheads were approved of, and scarce any of the Roman ladies that are celebrated for their other perfections, but are also praised for the redness of their hair. The nose also of the Grecian Venus was such as would appear at present an actual deformity, as it fell in a straight line from the forehead, without the smallest sinking between the eyes, without which we never see a face at present

Among the moderns, every country seems to have peculiar ideas of beauty.[*] The Persians admire large eye-brows, joining in the middle; the edges and corners of the eyes are tinctured with black, and the size of the head is increased by a great variety of bandages formed into a turban. In some parts of India, black teeth and white hair are desired with ardour; and one of the principal employments of the women of Thibet, is to redden the teeth with herbs, and to make their hair white by a certain preparation. The passion for coloured teeth obtains also in China and Japan; where to complete their idea of beauty, the object of desire must have little eyes, nearly closed, feet extremely small, and a waist far from being shapely. There are some nations of the American Indians that flatten the heads of their children, by keeping them, while young, squeezed between two boards, so as to make the visage much larger than it would naturally be. Others flatten the head at top; and others make it as round as they possibly can. The inhabitants along the western coasts of Africa have a very extraordinary taste for beauty. A flat nose, thick lips, and jet-black complexion, are there the most indulgent gifts of nature. Such, indeed, they are all, in some degree, found to possess. However, they take care, by art, to increase their natural deformities, as they should seem to us; and they have many additional methods of rendering their persons still more frightfully pleasing. The whole body and visage is often scarred with a variety of monstrous figures; which is not done without great pain, and repeated incision: and even sometimes parts of the body are cut away. But it would be endless to remark the various arts which caprice or custom has employed to distort and disfigure the body, in order to render it more pleasing; in fact, every nation, how barbarous soever, seems unsatisfied with the human figure, as nature has left it, and has its peculiar arts of heightening beauty. Painting, powdering, cutting, boring the nose and the ears, lengthening the one, and depressing the other, are arts practised in many countries; and, in some degree, admired in all. These arts might have been at first introduced to hide epidemic deformities; custom, by degrees, reconciles them to the view; till, from looking upon them with indifference, the eye at length begins to gaze with pleasure.

CHAPTER V

OF THE AGE OF MANHOOD[†]

The human body attains to its full height during the age of puberty; or, at least, a short time after. Some young people are found to cease growing at fourteen or fifteen; others continue their growth till two or three and twenty. During this period they are all of a slender make; their thighs and legs small, and the muscular parts are yet unfilled. But, by degrees, the fleshy fibres augment; the muscles swell, and assume their figure; the limbs become proportioned and rounder; and before the age of thirty, the body in men, has acquired the most perfect symmetry. In women, the body arrives at perfection much sooner, as they arrive at the age of maturity more early; the muscles, and all the other parts being weaker, less compact and solid, than those of man, they require less time in coming to perfection; and, as they are less in size, that size is sooner completed. Hence the persons of women are found to be as complete at twenty, as those of men are found to be at thirty.

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[*] Buffon.

[†] This chapter is translated from Mr. Buffon, whose description is very excellent. Whatever I have added, is marked by inverted commas. "thus." And in whatever trifling points I have differed, the notes will serve to show

The body of a well-shaped man ought to be square; the muscles should be expressed with boldness, and the lines of the face strongly marked. In the woman, all the muscles should be rounder, the lines softer, and the features more delicate. Strength and majesty belong to the man; grace and softness are the peculiar embellishments of the other sex. In both, every part of their form declares their sovereignty over other creatures. Man supports his body erect; his attitude is that of command: and his face, which is turned towards the heavens, displays the dignity of his station. The image of his soul is painted in his visage; and the excellence of his nature penetrates through the material form in which it is inclosed. His majestic port, his sedate and resolute step, announce the nobleness of his rank. He touches the earth only with his extremity; and beholds it as if at a disdainful distance. His arms are not given him, as to other creatures, for pillars of support; nor does he lose, by rendering them callous against the ground, that delicacy of touch which furnishes him with so many of his enjoyments. His hands are made for very different purposes; to second every intention of his will, and to perfect the gifts of Nature.

When the soul is at rest, all the features of the visage seem settled in a state of profound tranquillity. Their proportion, their union, and their harmony, seem to mark the sweet serenity of the mind, and give a true information of what passes within. But when the soul is excited, the human visage becomes a living picture; where the passions are expressed with as much delicacy as energy, where every motion is designed by some correspondent feature, where every impression anticipates the will, and betrays those hidden agitations, that he would often wish to conceal.

It is particularly in the eyes that the passions are painted; and in which we may most readily discover their beginning. The eye seems to belong to the soul more than any other organ; it seems to participate of all its emotions; as well the most soft and tender, as the most tumultuous and forceful. It not only receives, but transmits them by sympathy; the observing eye of one catches the secret fire from another: and the passion thus often becomes general.

Such persons as are short-sighted labour under a particular disadvantage in this respect. They are, in a manner, entirely cut off from the language of the eyes; and this gives an air of stupidity to the face, which often produces very unfavourable prepossessions. However intelligent we find such persons to be, we can scarcely be brought back from our first prejudice, and often continue in the first erroneous opinion. In this manner we are too much induced to judge of men by their physiognomy; and having, perhaps, at first caught up our judgments prematurely, they mechanically influence us all our lives after. This extends even to the very colour or the cut of people's clothes; and we should for this reason be careful, even in such trifling particulars, since they go to make up a part of the total judgment which those we converse with may form to our advantage.

The vivacity, or the languid motion of the eyes, gives the strongest marks to physiognomy; and their colour contributes still more to enforce the expression. The different colours of the eye are the dark hazle, the light hazle, the green, the blue and grey, the whitish grey, "and also the red." These different colours arise from the different colours of the little muscles that serve to contract the pupil; "and they are very often found to change colour with disorder and with age."

The most ordinary colours are the hazle and the blue, and very often both these colours are found in the eyes of the same person Those eyes which are called black, are only of the dark hazle, which may be easily seen upon closer inspection; however, those eyes are reckoned the most beautiful where the shade is the deepest: and either in these, or the blue eyes, the fire, which gives its finest expression to the eye, is more distinguishable in proportion to the darkness of the tint. For this reason, the black eyes, as they are called, have the greatest vivacity; but, probably, the blue have the most powerful effect in beauty, as they reflect a greater variety of lights, being composed of more various colours.

This variety, which is found in the colour of the eyes, is peculiar to man, and one or two other kinds of animals; but, in general, the colour in any one individual is the same in all the rest. The eyes of oxen are brown; those of sheep of a water colour; those of goats are gray; "and it may also be, in general, remarked, that the eyes of most white animals are red; thus the rabbit, the ferret, and, even in the human race, the white Moor, all have their eyes of a red colour."

Although the eye, when put into motion, seems to be drawn on one side, yet it only moves round the centre; by which its coloured part moves nearer, or farther from the angle of the eye-lids, or is elevated or depressed. The distance between the eyes is less in man than in any other animal; and in some of them it is so great, that it is impossible that they should ever view the same object with both eyes at once, unless it be very far off. "This, however, in them is rather an advantage than an inconvenience, as they are thus able to watch round them, and guard against the dangers of their precarious situation."

Next to the eyes, the features which most give a character to the face, are the eye-brows, which being, in some measure, more apparent than the other features, are most readily distinguished at a distance. "Le Brun, in giving a painter directions with regard to the passions, places the principal expression of the face in the eye-brows." From their elevation and depression, most of the furious passions are characterized; and such as have this feature extremely moveable, are usually known to have an expressive face. By means of these we can imitate all the other passions, as they are raised and depressed, at command; the rest of the features are generally fixed; or, when put into motion, they do not obey the will; the mouth and eyes, in an actor, for instance, may, by being violently distorted, give a very different expression from what he would intend; but the eye-brows can scarcely be exerted improperly; their being raised, denotes all those passions which pride or pleasure inspire; and their depression marks those which are the effects of contemplation and pain; and such who have this feature, therefore, most at command, are often found to excel as actors."

The eye-lashes have an effect, in giving expression to the eye, particularly when long and close; they soften its glances, and improve its sweetness. Man and apes are the only animals that have eye-lashes both upon the upper and lower lids; all other animals want them on the lid below.

The eye-lids serve to guard the ball of the eye, and to furnish it with a proper moisture. The upper lid rises and falls; the lower has scarce any motion; and although their being moved depends on the will, yet it often happens that the will is unable to keep them open, when sleep or fatigue oppresses the mind. In birds, and amphibious quadrupeds, the lower lid alone has motion; fishes and insects have no eye-lids whatever.

The forehead makes a large part of the face, and a part which chiefly contributes to its beauty. It ought to be justly proportioned; neither too round nor too flat; neither too narrow nor too low; and the hair should come thick upon its extremities. It is known to every body how much the hair tends to improve the face; and how much the being bald serves to take away from beauty. The highest part of the head is that which becomes bald the soonest, as well as that part which lies immediately above the temples. The hair under the temples, and at the back of the head, is very seldom known to fail, "and women are much less apt to become bald than men;" Mr. Buffon seems to think they never become bald at all; but we have too many instances of the contrary among us, not to contradict very easily the assertion. Of all parts or appendages of the body, the hair is that which is found most different in different climates; and often not only contributes to mark the country, but also the disposition of the man. It is in general thickest where the constitution is strongest; and more glossy and beautiful where the health is most permanent. The ancients held the hair to be a sort of excrement, produced like the nails; the part next the root pushing out that immediately contiguous. But the moderns have found that every hair may be truly said to live, to receive nutriment, to fill and distend itself like the other parts of the body. The roots, they observe, do not turn gray sooner than the extremities, but the whole hair changes colour at once; and we have many instances of persons who have grown gray in one night's time.[*] Each hair, if viewed with a microscope, is found to consist of five or six lesser ones, all wrapped up in one common covering; it appears knotted, like some sorts of grass, and sends forth branches at the joints. It is bulbous at the root, by which it imbibes its moisture from the body, and it is split at the points; so that a single hair, at its end resembles a brush. Whatever be the size, or the shape of the pore, through which the hair issues, it accommodates itself to the same; being either thick, as they are large; small, as they are less; round, triangular, and variously formed, as the pores happen to be various. The hair takes its colour from the juices flowing through it, and it is found that this colour differs in different tribes and races of people The Americans, and the Asiatics, have their hair black, thick, straight, and shining. The inhabitants of the torrid climates of Africa have it black, short, and woolly. The people of Scandinavia have it red, long, and curled; and those of our own, and the neighbouring countries, are found with hair of various colours. However, it is supposed by many, that every man resembles in his disposition the inhabitants of those countries whom he resembles in the colour and the nature of his hair; so that the black are said, like the Asiatics, to be grave and acute; the red, like the Gothic nations, to be choleric and bold. However this may be, the length and the strength of the hair is a general mark of a good constitution; and as that hair which is strongest is most commonly curled, so curled hair is generally regarded among us as a beauty. The Greeks, however, had a very different idea of beauty in this respect; and seem to have taken one of their peculiar national distinctions from the length and the straightness of the hair.

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[*] Mr Buffon says, that the hair begins to grow gray at the points, but the fact is otherwise.

The nose is the most prominent feature in the face; but, as it has scarce any motion, and that only in the strongest passions, it rather adds to the beauty than to the expression of the countenance. "However, I am told by the skilful in this branch of knowledge, that wide nostrils add a great deal to the bold and resolute air of the countenance; and where they are narrow, though it may constitute beauty, it seldom improves expression." The form of the nose, and its advanced position, are peculiar to the human visage alone. Other animals, for the most part, have nostrils, with a partition between them: but none of them have an elevated nose. Apes themselves have scarce any thing else of this feature, but the nostrils; the rest of the feature lying flat upon the visage, and scarce higher than the cheek-bones. "Among all the tribes of savage men also, the nose is very flat; and I have seen a Tartar who had scarce any thing else but two holes through which to breathe."

The mouth and lips, next to the eyes, are found to have the greatest expression. The passions have great power over this part of the face; and the mouth marks its different degrees by its different forms. The organ of speech still more animates this part, and gives it more life than any other feature in the countenance. The ruby colour of the lips, and the white enamel of the teeth, give it such a superiority over every other feature, that it seems to make the principal object of our regard. In fact, the whole attention is fixed upon the lips of the speaker; however rapid his discourse, however various the subject, the mouth takes correspondent situations; and deaf men have been often found to see the force of those reasonings which they could not hear understanding every word as it was spoken.

"The under jaw in man possesses a great variety of motions; while the upper has been thought by many to be quite immoveable.[*] However, that it moves in man, a very easy experiment will suffice to convince us. If we keep the head fixed, with any thing between our teeth, the edge of a table, for instance, and then open our mouths, we shall find that both jaws recede from it at the same time; the upper jaw rises, and the lower falls, and the table remains untouched between them. The upper jaw has motion as well as the under; and, what is remarkable, it has its proper muscles behind the head for thus raising and depressing it. Whenever, therefore, we eat, both jaws move at the same time, though very unequally; for the whole head moving with the upper jaw, of which it makes a part, its motions are thus less observable." In the human embryo, the under jaw is very much advanced before the upper. "In the adult, it hangs a good deal more backward; and those whose upper and under row of teeth are equally prominent, and strike directly against each other, are what the painters call under-hung; and they consider this as a great defect in beauty.[†] The under jaw in a Chinese face falls greatly more backward than with us; and, I am told, the difference is half an inch, when the mouth is shut naturally." In instances of the most violent passion, the under jaw has often an involuntary quivering motion; and often also, a state of languor produces another, which is that of yawning. "Every one knows how very sympathetic this kind of languid motion is: and that for one person to yawn, is sufficient to set all the rest of the company a yawning. A ridiculous instance of this was commonly practised upon the famous M'Laurin, one of the professors at Edinburgh. He was very subject to have his jaws dislocated; so that when he opened his mouth wider than ordinary, or when he yawned, he could not shut it again. In the midst of his harangues, therefore, if any of his pupils began to be tired of his lecture, he had only to gape or yawn, and the professor instantly caught the sympathetic affection; so that he thus continued to stand speechless, with his mouth wide open, till his servant, from the next room, was called in to set his jaw again."[‡]

When the mind reflects with regret upon some good unattained or lost, it feels an internal emotion, which acting upon the diaphragm, and that upon the lungs, produces a sigh; this, when the mind is strongly affected, is repeated; sorrow succeeds these first emotions; and tears are often seen to follow: sobbing is the sigh still more invigorated; and lamentation, or crying, proceeds from the continuance of the plaintive tone of the voice, which seems to implore pity. "There is yet a silent agony, in which the mind appears to disdain all external help, and broods over its distresses with gloomy reserve.

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[*] Mr. Buffon is of this opinion. He says that the upper jaw is immoveable in all animals. However, the parrot is an obvious exception; and so is man himself, as shown above.

[†] Mr. Buffon says, that both jaws, in a perfect face, should be on a level: but this is denied by the best painters.

[‡] Since the publication of this work, the editor has been credibly informed that the professor had not the defect here mentioned.

This is the most dangerous state of mind: accidents or friendship may lessen the louder kinds of grief; but all remedies for this must be had from within: and there, despair too often finds the most deadly enemy."

Laughter is a sound of the voice, interrupted and pursued for some continuance. The muscles of the belly and the diaphragm are employed in its slightest exertions; but those of the ribs are strongly agitated in the louder: and the head sometimes is thrown backward, in order to raise them with greater ease. The smile is often an indication of kindness and good will: it is also often used as a mark of contempt and ridicule.

Blushing proceeds from different passions, being produced by shame, anger, pride, and joy. Paleness is often also the effect of anger; and almost ever attendant on fright and fear. These alterations in the colour of the countenance are entirely involuntary; all the other expressions of the passions are, in some small degree, under control; but blushing and paleness betray our secret purposes; and we might as well attempt to stop them as the circulation of the blood, by which they are caused.

The whole head, as well as the features of the face, takes peculiar attitudes from its passions: it bends forward to express humility, shame, or sorrow; it is turned to one side, in languor or in pity; it is thrown with the chin forward, in arrogance and pride; erect in self-conceit and obstinacy; it is thrown backwards in astonishment; and combines its motions to the one side, and the other, to express contempt, ridicule, anger, and resentment. "Painters, whose study leads to the contemplation of external forms, are much more adequate judges of these than any naturalist can be; and it is with these a general remark, that no one passion is regularly expressed on different countenances in the same manner: that grief often sits upon the face like joy; and pride assumes the air of passion. It would be vain, therefore, in words, to express their general effect, since they are often as various as the countenances they sit upon; and in making this distinction nicely, lies all the skill of the physiognomist. In being able to distinguish what part of the face is marked by nature, and what by the mind; what part has been originally formed, and what is made by habit, constitutes this science, upon which the ancients so much valued themselves, and which we at present so little regard. Some, however, of the most acute men among us, have paid great attention to this art; and, by long practice, have been able to give some character of every person whose face they examined. Montaigne is well known to have disliked those men who shut one eye in looking upon any object; and Fielding asserts, that he never knew a person with a steady glavering smile, but he found him a rogue. However, most of these observations, tending to a discovery of the mind by the face, are merely capricious; and nature has kindly hid our hearts from each other, to keep us in good humour with our fellow-creatures."

The parts of the head which give the least expression to the face, are the ears; and they are generally found hidden under the hair. These, which are immoveable, and make so small an appearance in man, are very distinguishing features in quadrupeds. They serve in them as the principal marks of the passions; the ears discover their joys or their terrors with tolerable precision; and denote all their internal agitations. The smallest ears, in men, are said to be the most beautiful; but the largest are found to be the best for hearing. There are some savage nations who bore their ears, and so draw that part down, that the tips of the ears are seen to rest upon their shoulders.

The strange variety in the different customs of men appears still more extravagant in their manner of wearing their beards. Some, and among others, the Turks, cut the hair off their heads, and let their beards grow. The Europeans, on the contrary, shave their beards, and wear their hair. The negroes shave their heads in figures at one time, in stars at another, in the manner of friars; and still more commonly in alternate stripes; and their little boys are shaved in the same manner. The Talapoins of Siam shave the heads and the eye-brows of such children as are committed to their care. Every nation seems to have entertained different prejudices at different times, in favour of one part or another of the beard. Some have admired the hair upon the cheeks on each side, as we see with some low-bred men among ourselves, who want to be fine. Some like the hair lower down; some choose it curled, and others like it straight. “ Some have cut it into a peak, and others shave all but the whisker. This particular part of the beard was highly prized among the Spaniards: till of late, a man without whiskers was considered as unfit for company; and where nature had denied them, art took care to supply the deficiency. We are told of a Spanish general who, when he borrowed a large sum of money from the Venetians, pawned his whiskers, which he afterwards took proper care to release. Kingson assures us, that a considerable part of the religion of the Tartars consists in the management of their whiskers; and that they waged a long and bloody war with the Persians, declaring them infidels, merely because they would not give their whiskers the orthodox cut. The kings of Persia carried the care of their beards to a ridiculous excess, when they chose to wear them matted with gold thread: and even the kings of France, of the first races, had them knotted and buttoned with gold. But of all nations, the Americans take the greatest pains in cutting their hair, and plucking their beards. The under part of the beard, and all but the whisker, they take care to pluck up by the roots, so that many have supposed them to have no hair naturally growing on that part; and even Linnæus has fallen into that mistake. Their hair is also cut into bands; and no small care employed in adjusting the whisker. In fact, we have a very wrong idea of savage finery, and are apt to suppose that, like the beasts of the forest, they rise, and are dressed with a shake: but the reverse is true; for no birth-night beauty takes more time or pains in the adorning her person than they. I remember when the Cherokee kings were over here, that I have waited for three hours, during the time they were dressing. They never would venture to make their appearance till they had gone through the tedious ceremonies of the toilet; they had their boxes of oil and ochre, their fat and their perfumes, like the most effeminate beau, and generally took up four hours in dressing, before they considered themselves as fit to be seen We must not, therefore, consider a delicacy in poinof dress, as a mark of refinement, since savages are much more difficult in this particular than the most fashionable or tawdry European. The more barbarous the people, the fonder of finery. In Europe, the lustre of jewels, and the splendour of the most brilliant colours, are generally given up to women, or to the weakest part of the other sex, who are willing to be contemptibly fine: but in Asia, these trifling fineries are eagerly sought after by every condition of men; and, as the proverb has it, we find the richest jewels in an Ethiop's ear. The passion for glittering ornaments is still stronger among the absolute barbarians, who often exchange their whole stock of provisions, and whatever else they happen to be possessed of, with our seamen, for a glass bead, or a looking-glass.

Although fashions have arisen in different countries from fancy and caprice, these, when they become general, deserve examination. Mankind have always considered it as a matter of moment, and they will ever continue desirous of drawing the attention of each other, by such ornaments as mark the riches, the power, or the courage of the wearer. The value of those shining stones which have at all times been considered as precious ornaments, is entirely founded upon their scarceness or their brilliancy. It is the same likewise with respect to those shining metals, the weight of which is so little regarded, when spread over our clothes. These ornaments are rather designed to draw the attention of others, than to add to any enjoyments of our own; and few there are that these ornaments will not serve to dazzle, and who can coolly distinguish between the metal and the man.

All things rare and brilliant will, therefore, ever continue to be fashionable, while men derive greater advantage from opulence than virtue; while the means of appearing considerable, are more easily acquired than the title to be considered. The first impression we generally make, arises from our dress; and this varies, in conformity to our inclinations, and the manner in which we desire to be considered. The modest man, or he who would wish to be thought so, desires to show the simplicity of his mind by the plainness of his dress; the vain man, on the contrary, takes a pleasure in displaying his superiority, "and is willing to incur the spectator's dislike, so he does but excite his attention."

Another point of view which men have in dressing, is to increase the size of their figure, and to take up more room in the world than nature seems to have allotted them. We desire to swell out our clothes by the stiffness of art, and raise our heels, while we add to the largeness of our heads. How bulky soever our dress may be, our vanities are still more bulky. The largeness of the doctor's wig arises from the same pride with the smallness of the beau's queue. Both want to have the size of their understanding measured by the size of their heads.

There are some modes that seem to have a more reasonable origin, which is to hide or to lessen the defects of nature. To take men altogether, there are many more deformed and plain than beautiful and shapely. The former, as being the most numerous, give law to fashion, and their laws are generally such as are made in their own favour. The women begin to colour their cheeks with red, when the natural roses are faded; and the younger are obliged to submit, though not compelled by the same necessity. In all parts of the world, this custom prevails more or less; and powdering and frizzing the hair, though not so general, seems to have arisen from a similar control.

But leaving the draperies of the human picture, let us return to the figure, unadorned by art. Man's head, whether considered externally or internally, is differently formed from that of all other animals, the monkey-kind only excepted, in which there is a striking similitude. There are some differences, however, which we shall take notice of in another place. The bodies of all quadruped animals are covered with hair; but the head of man seems the part most adorned, and that more abundantly than in any other animal.

There is a very great variety in the teeth of all animals; some have them above and below; others have them in the under jaw only: in some they stand separate from each other; while in some they are continued and united. The palate of some fishes is nothing else but a bony plate studded with points, which perform the office of teeth. All these substances, in every animal, derive their origin from the nerves; the substance of the nerves hardens by being exposed to the air; and the nerves that terminate in the mouth, being thus exposed, acquire a bony solidity. In this manner, the teeth and nails are formed in man; and in this manner also, the beak, the hoofs, the horns, and the talons of other animals are found to be produced.

The neck supports the head, and unites it to the body. This part is much more considerable in the generality of quadrupeds, than in man. But fishes and other animals that want lungs similar to ours, have no neck whatsoever. Birds, in general, have the neck longer than any other kind of animals; those of them, which have short claws, have also short necks; those, on the contrary, that have them long, are found to have the neck in proportion. "In men, there is a lump upon the wind-pipe, formed by the thyroid cartilage, which is not to be seen in women; an Arabian fable says, that this is a part of the original apple, that has stuck in the man's throat by the way, but that the woman swallowed her part of it down."

The human breast is outwardly formed in a very different manner from that of other animals. It is larger in proportion to the size of the body; and none but man, and such animals as make use of their fore-feet as hands, such as monkeys, bats, and squirrels, and such quadrupeds as climb trees, are found to have those bones called the *clavicles*, or, as we usually term them, the *collar bones*.* The breasts in women are larger than in men; however, they seem formed in the same manner; and sometimes milk is found in the breasts of men as well as in those of women. Among animals, there is a great variety in this part of the body. The teats of some, as in the ape and the elephant, are like those of men, being but two, and placed on each side of the breast. The teats of the bear amount to four. The sheep has but two, placed between the hinder legs. Other animals, such as the bitch, and the sow, have them all along the belly; and as they produce many young, they have a great many teats for their support. The form also of the teats varies in different animals, and in the same animal at different ages. The bosom, in females, seems to unite all our ideas of beauty, where the outline is continually changing, and the gradations are soft and regular.

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* Mr. Buffon says that none but monkeys have them; but this is an over-sight.

"The graceful fall of the shoulders, both in man and woman, constitute no small part of beauty. In apes, though otherwise made like us, the shoulders are high, and drawn up on each side towards the ears. In man they fall by a gentle declivity; and the more so, in proportion to the beauty of his form. In fact, being high-shouldered, is not without reason considered as a deformity, for we find very sickly persons are always so; and people when dying are ever seen with their shoulders drawn up in a surprising manner. The muscles that serve to raise the ribs, mostly rise near the shoulders; and the higher we raise the shoulders, we the more easily raise the ribs likewise. It happens, therefore, in the sickly and the dying, who do not breathe without labour, that to raise the ribs, they are obliged to call in the assistance of the shoulders; and thus their bodies assume from habit, that form which they are so frequently obliged to assume. Women with child also are usually seen to be high-shouldered; for the weight of the inferior parts drawing down the ribs, they are obliged to use every effort to elevate them, and thus they raise the shoulders of course. During pregnancy, also, the shape, not only of the shoulders, but also of the breast, and even the features of the face, are greatly altered; for the whole upper fore-part of the body is covered with a broad thin skin, called the myoides, which, being at that time drawn down, it also draws down with it the skin, and consequently the features of the face. By these means the visage takes a particular form; the lower eye-lids, and the corners of the mouth, are drawn downwards, so that the eyes are enlarged, and the mouth lengthened; and women, in these circumstances, are said by the midwives, to be *all mouth and eyes.*"

The arms of men but very little resemble the fore-feet of quadrupeds, and much less the wings of birds. The ape is the only animal that is possessed of hands and arms; but these are much more rudely fashioned, and with less exact proportion, than in men; "the thumb not being so well opposed to the rest of the fingers in their hands, as in ours."

The form of the back is not much different in man from that of other quadruped animals, only that the reins are more muscular in him, and stronger. The buttock, however, in man, is different from that of all other animals whatsoever. What goes by that name in other creatures, is only the upper part of the thigh; man being the only animal that supports himself perfectly erect, the largeness of this part is owing to the peculiarity of his position.

Man's feet, also, are different from those of all other animals, those even of apes not excepted. The foot of the ape is rather a kind of awkward hand; its toes, or rather fingers, are long, and that of the middle, longest of all. This foot also wants the heel, as in man; the sole is narrower, and less adapted to maintain the equilibrium of the body in walking, dancing, or running.

The nails are less in man than in any other animal. If they were much longer than the extremities of the fingers, they would rather be prejudicial than serviceable, and obstruct the management of the hand. Such savages as let them grow long, make use of them in flaying animals, in tearing their flesh, and such like purposes; however, though their nails are considerably larger than ours, they are by no means to be compared to the hoofs or the claws of other animals. "They may sometimes be seen longer, indeed, than the claws of any animal whatsoever: as we learn that the nails of some of the learned men in China are longer than their fingers. But these want that solidity which might give force to their exertions, and could never, in a state of nature, have served them for annoyance or defence."

There is little known exactly with regard to the proportion of the human figure; and the beauty of the best statues is better conceived, by observing than by measuring them. The statues of antiquity. which were at first copied after the human form, are now become the models of it; nor is there one man found whose person approaches to those inimitable performances that have thus, in one figure, united the perfections of many. It is sufficient to say, that from being at first models, they are now become originals, and are used to correct the deviations in that form from whence they were taken." I will not, however, pretend to give the proportions of the human body as taken from these, there being nothing more arbitrary, and which good painters themselves so much contemn. Some, for instance, who have studied after these, divide the body into ten times the length of the face, and others into eight. Some pretend to tell us, that there is a similitude of proportion in different parts of the body. Thus, that the hand is the length of the face, the thumb the length of the nose, the space between the eyes is the breadth of an eye; that the breadth of the thigh, at thickest, is double that of the thickest part of the leg, and treble the smallest; that the arms extended, are as long as the figure is high; that the legs and thighs are half the length of the figure. All this, however, is extremely arbitrary; and the excellence of a shape, or the beauty of a statue, results from the attitude and position of the whole, rather than any established measurements, begun without experience, and adopted by caprice. In general, it may be remarked that the proportions alter in every age, and are obviously different in the two sexes. In women, the shoulders are narrower, and the neck proportionably longer than in men. The hips, also, are considerably larger, and the thighs much shorter than in men. These proportions, however, vary greatly at different ages. In infancy, the upper parts of the body are much larger than the lower; the legs and thighs do not constitute any thing like half the height of the whole figure; in proportion as the child increases in age, the inferior parts are found to lengthen; so that the body is not equally divided until it has acquired its full growth.

The size of men varies considerably. Men are said to be tall who are from five feet eight inches to six feet high. The middle stature is from five feet five to five feet eight: and those are said to be of small stature who fall under these measures. "However, it ought to be remarked, that the same person is always taller when he rises in the morning, than upon going to bed at night; and sometimes there is an inch difference; and I have seen more. Few persons are sensible of this remarkable variation; and, I am told, it was first perceived in England by a recruiting officer. He often found that those men whom he had enlisted for soldiers, and answered to the appointed standard at one time, fell short of it when they came to be measured before the colonel at the head-quarters. This diminution in their size proceeded from the different times of the day, and the different states of the body, when they happened to be measured. If, as was said, they were measured in the morning, after the night's refreshment, they were found to be commonly half an inch, and very often a whole inch, taller than if measured after the fatigues of the day; if they were measured when fresh in the country, and before a long fatiguing march to the regiment, they were found to be an inch taller than when they arrived at their journey's end. All this is now well known among those who recruit for the army; and the reason of this difference of stature is obvious. Between all the joints of the back-bone, which is composed of several pieces, there is a glutinous liquor deposited, which serves, like oil in a machine, to give the parts an easy play upon each other. This lubricating liquor, or synovia, as the anatomists call it, is poured in during the season of repose, and is consumed by exercise and employment; so that in a body, after hard labour, there is scarce any of it remaining; but all the joints grow stiff, and their motion becomes hard and painful. It is from hence, therefore, that the body diminishes in stature. For this moisture being drained away from between the numerous joints of the back-bone, they lie closer upon each other; and their whole length is thus very sensibly diminished; but sleep, by restoring the fluid again, swells the spaces between the joints, and the whole is extended to its former dimensions.

"As the human body is thus often found to differ from itself in size, so it is found to differ in its weight also; and the same person, without any apparent cause, is found to be heavier at one time than another. If, after having eaten a hearty dinner, or having drank hard, the person should find himself thus heavier, it would appear no way extraordinary; but the fact is, the body is very often found heavier some hours after eating a hearty meal than immediately succeeding it. If, for instance, a person fatigued by a day's hard labour, should eat a plentiful supper, and then get himself weighed upon going to bed, after sleeping soundly, if he is again weighed, he will find himself considerably heavier than before; and this difference is often found to amount to a pound, or sometimes to a pound and a half. From whence this adventitious weight is derived is not easy to conceive; the body, during the whole night, appears rather plentifully perspiring than imbibing any fluid; rather losing than gaining moisture: however, we have no reason to doubt but that either by the lungs, or perhaps, by a peculiar set of pores, it is all this time inhaling a quantity of fluid, which thus increases the weight of the whole body upon being weighed the next morning."[*]

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[*] From this experiment, also, the learned may gather upon what a weak foundation the whole doctrine of the Sanctorian perspiration is built; but this disquisition more properly belongs to medicine than natural history

Although the human body is externally more delicate than any of the quadruped kind, it is, notwithstanding, extremely muscular; and perhaps, for its size, stronger than that of any other animal. If we should offer to compare the strength of the lion with that of man, we should consider that the claws of this animal give us a false idea of its power; we ascribe to its force what is only the effects of its arms. Those which man has received from Nature are not offensive; happy had Art never furnished him with any more terrible than those which arm the paws of the lion.

But there is another manner* of comparing the strength of man with that of other animals; namely, by the weights which either can carry. We are assured that the porters of Constantinople carry burdens of nine hundred pounds weight. Mr. Desaguliers tells us of a man who, by distributing weights in such a manner as that every part of his body bore its share, he was thus able to raise a weight of two thousand pounds. A horse, which is about seven times our bulk, would be thus able to raise a weight of fourteen thousand pounds, if its strength were in the same proportion.† "But the truth is, a horse will not carry upon his back above a weight of two or three hundred pounds; while a man of confessedly inferior strength, is thus able to support two thousand. Whence comes this seeming superiority? The answer is obvious. Because the load upon the man's shoulders is placed to the greatest advantage; while, upon the horse's back, it is placed at the greatest disadvantage. Let us suppose, for a moment, the man standing as upright as possible, under the great load above mentioned. It is obvious that all the bones of his body may be compared to a pillar supporting a building, and that his muscles have scarce any share in this dangerous duty. However, they are not entirely inactive; as man, let him stand never so upright, will have some bending in the different parts of his body. The muscles, therefore, give the bones some assistance, and that with the greatest possible advantage. In this manner a man has been found to support two thousand weight, but may be capable of supporting a still greater. The manner in which this is done, is by strapping the load round the shoulders of the person who is to bear it, by a machine, something like that by which milk-vessels or water-buckets are carried. The load being thus placed on a scaffold, on each side, contrived for that purpose, and the man standing erect in the midst, all parts of the scaffold, except that where the man stands, are made to sink; and thus the man maintaining his position, the load, whatever it is, becomes suspended, and the column of his bones may be fairly said to support it. If, however, he should but ever so little give way, he must inevitably drop: and no power of his can raise the weights again. But the case is very different with regard to a load laid upon a horse. The column of the bones there lies a different way; and a weight of five hundred pounds, as I am told, would break the back of the strongest horse that could be found. The great force of a horse, and other quadrupeds, is exerted when the load is in such a position as that the column of the bones can be properly applied, which is lengthwise. When, therefore, we are to estimate the comparative strength of a horse, we are not to try what he can carry, but what he can draw; and, in this case, his amazing superiority over man is easily discerned; for one horse can draw a load that ten men cannot move. And in some cases it happens that a draught-horse draws the better for being somewhat loaded: for, as the peasants say, the load upon the back keeps him the better to the ground."

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* Mr. Buffon calls it a better manner; but this is not the case.

† Mr. Buffon carries this subject no farther; and thus far, without explanation, it is erroneous

There is still another way of estimating human strength, by the perseverance and agility of our motions. Men who are exercised in running, outstrip horses, or at least hold their speed for a longer continuance. In a journey, also, a man will walk down a horse; and, after they have both continued to proceed for several days, the horse will be quite tired, and the man will be fresher than in the beginning. The king's messengers of Ispahan, who are runners by profession, go thirty-six leagues in fourteen hours. Travellers assure us, that the Hottentots outstrip lions in the chace; and that the savages who hunt the elk, pursue with such speed, that they at last tire down, and take it. We are told many very surprising things of the great swiftness of the savages, and of the long journeys they undertake on foot, through the most craggy mountains, where there are no paths to direct, nor houses to entertain them. They are said to perform a journey of twelve hundred leagues in less than six weeks. "But notwithstanding what travellers report of this matter, I have been assured, from many of our officers and soldiers, who compared their own swiftness with that of the native Americans, during the last war, that although the savages held out, and as the phrase is, had better bottoms, yet, for a spurt, the Englishmen were more nimble and speedy."

Nevertheless, in general, civilized man is ignorant of his own powers: he is ignorant how much he loses by effeminacy, and what might be acquired by habit and exercise. Here and there, indeed, men are found among us of extraordinary strength; but that strength, for want of opportunity, is seldom called into exertion. "Among the ancients, it was a quality of much greater use than at present; as in war the same man that had strength sufficient to carry the heaviest armour, had strength sufficient also to strike the most fatal blow. In this case, his strength was at once his protection and his power. We ought not to be surprised, therefore, when we hear of one man terrible to an army, and irresistible in his career, as we find some generals represented in ancient history. But we may be very certain that this prowess was exaggerated by flattery, and exalted by terror. An age of ignorance is ever an age of wonder. At such times, mankind, having no just ideas of the human powers, are willing rather to represent what they wish, than what they know; and exalt human strength, to fill up the whole sphere of their limited conceptions. Great strength is an accidental thing; two or three in a country may possess it, and these may have a claim to heroism. But what may lead us to doubt of the veracity of these accounts is, that the heroes of antiquity are represented as the sons of heroes; their amazing strength is delivered down from father to son: and this we know to be contrary to the course of nature. Strength is not hereditary, although titles are: and I am very much induced to believe that this great tribe of heroes, who were all represented as the descendants of heroes, are more obliged to their titles than to their strength for their characters. With regard to the shining characters in Homer, they are all represented as princes, and as the sons of princes, while we are told of scarce any share of prowess in the meaner men of the army, who are only brought into the field for these to protect or to slaughter. But nothing can be more unlikely, than that those men who were bred in the luxury of courts, should be strong, while the whole body of the people, who receive a plainer and simpler education, should be comparatively weak. Nothing can be more contrary to the general laws of nature, than that all the sons of heroes should thus inherit not only the kingdoms, but the strength of their forefathers; and we may conclude, that they owe the greatest share of their imputed strength rather to the dignity of their stations than the force of their arms; and, like all fortunate princes, their flatterers happened to be believed. In latter ages, indeed, we have some accounts of amazing strength, which we can have no reason to doubt of. But in these, nature is found to pursue her ordinary course, and we find their strength accidental. We find these strong men among the lowest of the people, and gradually rising into notice, as this superiority had more opportunity of being seen. Of this number was the Roman tribune, who went by the name of the second Achilles, who, with his own hand, is said to have killed, at different times, three hundred of the enemy; and when treacherously set upon, by twenty-five of his own countrymen, although then past his sixtieth year, killed fourteen of them before he was slain. Of this number was Milo, who, when he stood upright, could not be forced out of his place. Pliny also tells us of one Athanatus, who walked across the stage at Rome, loaded with a breastplate weighing five hundred pounds, and buskins of the same weight. But of all the prodigies of strength, of whom we have any accounts in Roman history, Maximin, the emperor, is to be reckoned the foremost. Whatever we are told relative to him is well attested; his character was too exalted not to be thoroughly known; and that very strength for which he was celebrated, at last procured him no less a reward than the empire of the world. Maximin was above nine feet in height, and the best proportioned man in the whole empire. He was by birth a Thracian; and, from being a simple herdsman, rose through the gradations of office, until he came to be emperor of Rome. The first opportunity he had of exerting his strength, was in the presence of all the citizens, in the theatre, where he overthrew twelve of the strongest men in wrestling, and outstript two of the fleetest horses in running, all in one day. He could draw a chariot loaden, that two strong horses could not move; he could break a horse's jaw with a blow of his fist; and its thigh with a kick. In war he was always foremost and invincible: happy had it been for him and his subjects, if, from being formidable to his enemies, he had not become still more so to his subjects; he reigned for some time with all the world his enemy; all mankind wishing him dead, yet none daring to strike the blow. As if fortune had resolved that through life he should continue unconquerable, he was killed at ast by his own soldiers, while he was sleeping. We have many other instances in later ages of very great strength, and not fewer of amazing swiftness; but these merely corporeal perfections are now considered as of small advantage, either in war or in peace. The invention of gunpowder has, in some measure, levelled all force to one standard, and has wrought a total change in martial education through all parts of the world. In peace also, the invention of new machines every day, and the application of the strength of the lower animals to the purposes of life, have rendered human strength less valuable. The boast of corporeal force is therefore consigned to savage nations, where those arts not being introduced, it may still be needful; but in more polite countries, few will be proud of that strength which other animals can be taught to exert to as useful purposes as they.

"If we compare the largeness and thickness of our muscles with those of any other animal, we shall find that, in this respect, we have the advantage; and if strength or swiftness depended upon the quantity of muscular flesh alone, I believe that, in this respect, we should be more active and powerful than any other. But this is not the case; a great deal more than the size of the muscles goes to constitute activity or force; and it is not he who has the thickest legs that can make the best use of them. Those, therefore, who have written elaborate treatises on muscular force, and have estimated the strength of animals by the thickness of their muscles, have been employed to very little purpose. It is in general observed, that thin and raw-boned men are always stronger and more powerful than such as are seemingly more muscular, as in the former all the parts have better room for their exertions."

Women want much of the strength of men; and, in some countries, the stronger sex have availed themselves of this superiority, in cruelly and tyrannically enslaving those who were made with equal pretensions to a share in all the advantages life can bestow. Savage nations oblige their women to a life of continual labour; upon them rest all the drudgeries of domestic duty, while the husband, indolently reclined in his hammock, is first served from the fruits of her industry. From this negligent situation he is seldom roused, except by the calls of appetite, when it is necessary, either by fishing or hunting, to make a variety in his entertainments. A savage has no idea of taking pleasure in exercise; he is surprised to see a European walk forward for his amusement, and then return back again. As for his part, he could be contented to remain for ever in the same situation, perfectly satisfied with sensual pleasures and undisturbed repose. The women of these countries are the greatest slaves upon earth; sensible of their weakness, and unable to resist, they are obliged to suffer those hardships which are naturally inflicted by such as have been taught that nothing but corporeal force ought to give pre-eminence. It is not, therefore, till after some degree of refinement, that women are treated with lenity; and not till the highest degree of politeness, that they are permitted to share in all the privileges of man. The first impulse of savage nature is to confirm their slavery; the next, of half barbarous nations, is to appropriate their beauty; and that of the perfectly polite, to engage their affections. In civilized countries, therefore, women have united the force of modesty to the power of their natural charms, and thus obtain that superiority over the mind which they are unable to extort by their strength.

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CHAPTER VI.

OF SLEEP AND HUNGER.

As man, in all the privileges he enjoys, and the powers he is invested with, has a superiority over all other animals, so in his necessities he seems inferior to the meanest of them all. Nature has brought him into life with a greater variety of wants and infirmities than the rest of her creatures, unarmed in the midst of enemies. The lion has natural arms; the bear natural clothing; but man is destitute of all such advantages; and, from the superiority of his mind alone, he is to supply the deficiency. The number of his wants, however, were merely given in order to multiply the number of his enjoyments, since the possibility of being deprived of any good, teaches him the value of his possession. Were men born with those advantages which he learns to possess by industry, he would very probably enjoy them with a blunter relish; it is by being naked that he knows the value of a covering; it is by being exposed to the weather, that he learns the comforts of a habitation. Every want thus becomes a means of pleasure in the redressing; and the animal that has most desires, may be said to be capable of the greatest variety of happiness.

Besides the thousand imaginary wants peculiar to man, there are two which he has in common with all other animals, and which he feels in a more necessary manner than they. These are the wants of sleep and hunger. Every animal that we are acquainted with, seems to endure the want of these with much less injury to health than man; and some are most surprisingly patient in enduring both. The little domestic animals that we keep about us, may often set a lesson of calm resignation, in supporting want and watchfulness, to the boasted philosopher. They receive their pittance at uncertain intervals, and wait its coming with cheerful expectation. We have instances of the dog and the cat living in this manner, without food, for several days, and yet still preserving their attachment to the tyrant that oppresses them; still ready to exert their little services for his amusement or defence. But the patience of these is nothing to what the animals of the forest endure. As these mostly live upon accidental carnage, so they are often known to remain without food for several weeks together. Nature, kindly solicitous for their support, has also contracted their stomachs, to suit them for their precarious way of living; and kindly, while it abridges the banquet, lessens the necessity of providing for it. But the meaner tribes of animals are made still more capable of sustaining life without food, many of them remaining in a state of torpid indifference till their prey approaches, when they jump upon and seize it. In this manner, the snake or the spider continue for several months together, to subsist upon a single meal;

and some of the butterfly kind live upon little or nothing. But it is very different with man: his wants daily make their importunate demands; and it is known that he cannot continue to live many days without eating, drinking, and sleeping.

Hunger is a much more powerful enemy to man than watchfulness, and kills him much sooner. It may be considered as a disorder that food removes, and that would quickly be fatal, without its proper antidote. In fact, it is so terrible to man, that to avoid it he even encounters certain death; and rather than endure its tortures, exchanges them for immediate destruction. However, by what I have been told, it is much more dreadful in its approaches, than in its continuance; and the pains of a famishing wretch decrease, as his strength diminishes. In the beginning, the desire of food is dreadful indeed, as we know by experience, for there are few who have not, in some degree, felt its approaches. But, after the first or second day, its tortures become less terrible, and a total insensibility at length comes kindly in to the poor wretch's assistance. I have talked with the captain of a ship, who was one of six that endured it in its extremities, and who was the only person that had not lost his senses, when they received accidental relief. He assured me his pains at first were so great as to be often tempted to eat a part of one of the men who died, and which the rest of his crew actually for some time lived upon: he said, that during the continuance of this paroxysm, he found his pains insupportable, and was desirous at one time of anticipating that death which he thought inevitable; but his pains, he said, gradually decreased, after the sixth day, (for they had water in the ship, which kept them alive so long) and then he was in a state rather of languor than desire; nor did he much wish for food, except when he saw others eating; and that for a while revived his appetite, though with diminished importunity. The latter part of the time, when his health was almost destroyed, a thousand strange images rose upon his mind, and every one of his senses began to bring him wrong information. The most fragrant perfumes appeared to him to have a fœtid smell; and every thing he looked at took a greenish hue, and sometimes a yellow. When he was presented with food by the ship's company that took him and his men up, (four of whom died shortly after,) he could not help looking upon it with loathing, instead of desire; and it was not till after four days that his stomach was brought to its natural tone, when the violence of his appetite returned with a sort of canine eagerness.

Thus dreadful are the effects of hunger; and yet when we come to assign the cause that produces them, we find the subject involved in doubt and intricacy. This longing eagerness is, no doubt, given for a very obvious purpose; that of replenishing the body, wasted by fatigue and perspiration. Were not men stimulated by such a pressing monitor, they might be apt to pursue other amusements with a perseverance beyond their power, and forget the useful hours of refreshment, in those tempting ones of pleasure. But hunger makes a demand that will not be refused; and, indeed. the generality of mankind seldom await the call.

Hunger has been supposed by some to arise from the rubbing of the coats of the stomach against each other, without having any intervening substance to prevent their painful attrition. Others have imagined that its juices, wanting their necessary supply, turn acrid, or as some say, pungent, and thus fret its internal coats, so as to produce a train of the most uneasy sensations. Boerhaave, who established his reputation in physic by uniting the conjectures of all those that preceded him, ascribes hunger to the united effects of both these causes, and asserts, that the pungency of the gastric juices, and the attrition of its coats against each other, cause those pains, which nothing but food can remove. These juices continuing still to be separated in the stomach, and every moment becoming more acrid, mix with the blood, and infect the circulation; the circulation being thus contaminated, becomes weaker, and more contracted; and the whole nervous frame sympathising, a hectic fever, and sometimes madness, is produced, in which state the faint wretch expires. In this manner, the man who dies of hunger may be said to be poisoned by the juices of his own body, and is destroyed less by the want of nourishment than by the vitiated qualities of that which he had already taken.

However this may be, we have but few instances of men dying, except at sea, of absolute hunger. The decline of those unhappy creatures who are destitute of food, at land, being more slow and unperceived. These, from often being in need, and as often receiving an accidental supply, pass their lives between surfeiting and repining; and their constitution is impaired by insensible degrees. Man is unfit for a state of precarious expectation. That share of provident precaution which incites him to lay up stores for a distant day, becomes his torment, when totally unprovided against an immediate call. The lower race of animals, when satisfied, for the instant moment, are perfectly happy: but it is otherwise with man; his mind anticipates distress, and feels the pangs of want even before it arrests him. Thus the mind, being continually harassed by the situation, it at length influences the constitution, and unfits it for all its functions. Some cruel disorder, but no way like hunger, seizes the unhappy sufferer; so that almost all those men who have thus long lived by chance, and whose every day may be considered as a happy escape from famine, are known at last to die in reality, of a disorder caused by hunger, but which, in the common language, is often called a *broken heart.* Some of these I have known myself, when very little able to relieve them: and I have been told by a very active and worthy magistrate, that the number of such as die in London for want, is much greater than one would imagine—I think he talked of two thousand in a year!

But how numerous soever those who die of hunger may be, many times greater, on the other hand, are the number of those who die by repletion. It is not the province of the present page to speculate with the physician upon the danger of surfeits; or with the moralist, upon the nauseousness of gluttony; it will only be proper to observe, that as nothing is so prejudicial to health as hunger by constraint, so nothing is more beneficial to the constitution than voluntary abstinence. It was not without reason that religion enjoined this duty; since it answered the double purpose of restoring the health oppressed by luxury, and diminished the consumption of provisions, so that a part might come to the poor. It should be the business of the legislature, therefore, to enforce this divine precept; and thus, by restraining one part of mankind in the use of their superfluities, to consult for the benefit of those who want the necessaries of life. The injunctions for abstinence are strict over the whole continent; and were rigorously observed, even among ourselves, for a long time after the Reformation. Queen Elizabeth, by giving her commands upon this head the air of a political injunction, lessened, in a great measure, and, in my opinion, very unwisely, the religious force of the obligation. She enjoined that her subjects should fast from flesh on Fridays and Saturdays, but at the same time declared, that this was not commanded from motives of religion, as if there were any differences in meats, but merely to favour the consumption of fish, and thus to multiply the number of mariners, and also to spare the stock of sheep, which might be more beneficial in another way. In this manner the injunction defeated its own force; and this most salutary law became no longer binding, when it was supposed to come purely from man. How far it may be enjoined in the scriptures, I will not take upon me to say; but this may be asserted, that if the utmost benefit to the individual, and the most extensive advantage to society, serve to mark any institution as of Heaven, this of abstinence may be reckoned among the foremost.

Were we to give a history of the various benefits that have arisen from this command, and how conducive it has been to long life, the instances would fatigue with their multiplicity. It is surprising to what a great age the primitive Christians of the East, who retired from persecution in the deserts of Arabia, continued to live in all the bloom of health, and yet all the rigours of abstemious discipline. Their common allowance, as we are told, for four and twenty hours, was twelve ounces of bread, and nothing but water. On this simple beverage St. Anthony is said to have lived a hundred and five years; James the hermit, a hundred and four; Arsenius, tutor to the emperor Arcadius, a hundred and twenty; St. Epiphanius, a hundred and fifteen; Simeon, a hundred and twelve; and Rombald, a hundred and twenty. In this manner did these holy, temperate men live to an extreme old age, kept cheerful by strong hopes, and healthful by moderate labour.

Abstinence which is thus voluntary, may be much more easily supported than constrained hunger. Man is said to live without food for seven days, which is the usual limit assigned him; and perhaps in a state of constraint, this is the longest time he can survive the want of it. But in cases of voluntary abstinence, of sickness, or sleeping, he has been known to live much longer.

In the records of the Tower, there is an account of a Scotchman, imprisoned for felony, who, for the space of six weeks, took not the least sustenance, being exactly watched during the whole time; and for this he received the king's pardon.

When the American Indians undertake long journies, and when, consequently, a stock of provisions sufficient to support them the whole way, would be more than they could carry, in order to obviate this inconvenience, instead of carrying the necessary quantity, the contrive a method of palliating their hunger by swallowing pills made of calcined shells and tobacco. These pills take away all appetite, by producing a temporary disorder in the stomach; and, no doubt, the frequent repetition of this wretched expedient must at last be fatal. By this means, however, they continue several days without eating, cheerfully bearing such extremes of fatigue and watching, as would quickly destroy men bred up in a greater state of delicacy. For those arts by which we learn to obviate our necessities, do not fail to unfit us for their accidental encounter.

Upon the whole, therefore, man is less able to support hunger than any other animal; and he is not better qualified to support a state of watchfulness. Indeed, sleep seems much more necessary to him, than to any other creature: as, when awake, he may be said to exhaust a greater proportion of the nervous fluid, and consequently to stand in need of an adequate supply. Other animals, when most awake, are but little removed from a state of slumber; their feeble faculties, imprisoned in matter, and rather exerted by impulse than deliberation require sleep rather as a cessation from motion than from thinking. But it is otherwise with man; his ideas, fatigued with their various excursions, demand a cessation, not less than the body, from toil; and he is the only creature that seems to require sleep from double motives: not less for the refreshment of the mental, than of the bodily frame.

There are some lower animals, indeed, that seem to spend the greatest part of their lives in sleep; but, properly speaking, the sleep of such may be considered as a kind of death, and their waking a resurrection. Flies and insects are said to be asleep at a time when all the vital motions have ceased; without respiration, without any circulation of their juices, if cut in pieces, they do not awake, nor does any fluid ooze out at the wound. These may be considered rather as congealed than as sleeping animals; and their rest, during winter, rather as a cessation from life than a necessary refreshment; but in the higher races of animals, whose blood is not thus congealed and thawed by heat, these all bear the want of sleep much better than man; and some of them continue a long time without seeming to take any refreshment from it whatsoever.

But man is more feeble; he requires its due return; and if it fails to pay the accustomed visit, his whole frame is in a short time thrown into disorder; his appetite ceases; his spirits are dejected; his pulse becomes quicker and harder; and his mind, abridged of its slumbering visions, begins to adopt waking dreams. A thousand strange phantoms arise, which come and go without his will: these, which are transient in the beginning, at last take firm possession of the mind, which yields to their dominion, and after a long struggle, runs into confirmed madness. In that horrid state, the mind may be considered as a city without walls, open to every insult, and paying homage to every invader; every idea that then starts with any force, becomes a reality; and the reason, over-fatigued with its former importunities, makes no head against the tyrannical invasion, but submits to it from mere imbecility.

But it is happy for mankind, that this state of inquietude is seldom driven to an extreme; and that there are medicines which seldom fail to give relief. However, man finds it more difficult than any other animal to procure sleep; and some are obliged to court its approaches for several hours together before they incline to rest. It is in vain that all light is excluded; that all sounds are removed; that warmth and softness conspire to invite it: the restless and busy mind still retains its former activity; and reason, that wishes to lay down the reins, in spite of herself, is obliged to maintain them. In this disagreeable state, the mind passes from thought to thought, willing to lose the distinctness of perception by increasing the multitude of the images. At last, when the approaches of sleep are near, every object of the imagination begins to mix with that next it; their outlines become in a manner rounder; a part of their distinctions fade away; and sleep, that ensues, fashions out a dream from the remainder.

If then it should be asked from what cause this state of repose proceeds, or in what manner sleep thus binds us for several hours together, I must fairly confess my ignorance, although it is easy to tell what philosophers say upon the subject. Sleep, says one of them,* consists in a scarcity of spirits, by which the orifices or pores of the nerves in the brain, through which the spirits used to flow into the nerves, being no longer kept open by the frequency of the spirits, shut of themselves; thus the nerves, wanting a new supply of spirits, become lax, and unfit to convey any impression to the brain. All this, however, is explaining a very great obscurity by somewhat more obscure; leaving, therefore, those spirits to open and shut the entrances to the brain, let us be contented with simply enumerating the effects of sleep upon the human constitution.

In sleep, the whole nervous frame is relaxed, while the heart and the lungs seem more forcibly exerted. This fuller circulation produces also a swelling of the muscles, as they always find who sleep with ligatures on any part of their body. The increased circulation also, may be considered as a kind of exercise, which is continued through the frame; and, by this, the perspiration becomes more copious, although the appetite for food is entirely taken away. Too much sleep dulls the apprehension, weakens the memory, and unfits the body for labour. On the contrary, sleep too much abridged, emaciates the frame, produces melancholy, and consumes the constitution. It requires some care, therefore, to regulate the quantity of sleep, and just to take as much as will completely restore nature, without oppressing it. The poor, as Otway says, sleep little; forced, by their situation, to lengthen out their labour to their necessities, they have but a short interval for this pleasing refreshment; and I have ever been of opinion, that bodily labour demands a less quantity of sleep than mental. Labourers and artizans are generally satisfied with about seven hours; but I have known some scholars who usually slept nine, and perceived their faculties no way impaired by oversleeping.

The famous Philip Barretiere, who was considered as a prodigy of learning at the age of fourteen, was known to sleep regularly twelve hours in the twenty-four; the extreme activity of his mind, when awake, in some measure called for an adequate alternation of repose; and, I am apt to think, that when students stint themselves in this particular, they lessen the waking powers of the imagination, and weaken its most strenuous exertions. Animals that seldom think, as was said, can very easily dispense with sleep; and of men, such as think least, will, very probably, be satisfied with the smallest share. A life of study, it is well known, unfits the body for receiving this gentle refreshment; the approaches of sleep are driven off by thinking: when, therefore, it comes at last, we should not be too ready to interrupt its continuance.

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* Rohault.

Sleep is, indeed, to some, a very agreeable period of their existence and it has been a question in the schools, which was most happy, the man who was a beggar by night, and a king by day; or he who was a beggar by day, and a king by night? It is given in favour of the nightly monarch, by him who first started the question: "For the dream," says he, "gives the full enjoyment of the dignity, without its attendant inconveniences: while, on the other hand, the king, who supposes himself degraded, feels all the misery of his fallen fortune, without trying to find the comforts of his humble situation. Thus, by day, both states have their peculiar distresses: but, by night, the exalted beggar is perfectly blessed, and the king completely miserable." All this, however, is rather fanciful than just; the pleasure dreams can give us, seldom reaches to our waking pitch of happiness: the mind often, in the midst of its highest visionary satisfactions, demands of itself, whether it does not owe them to a dream; and frequently awakes with the reply.

But it is seldom, except in cases of the highest delight, or the most extreme uneasiness, that the mind has power thus to disengage itself from the dominion of fancy. In the ordinary course of its operations, it submits to those numberless phantastic images that succeed each other, and which, like many of our waking thoughts, are generally forgotten. Of these, however, if any, by their oddity, or their continuance, affect us strongly, they are then remembered; and there have been some who felt their impressions so strongly as to mistake them for realities, and to rank them among the past actions of their lives.

There are others upon whom dreams seem to have a very different effect, and who, without seeming to remember their impressions the next morning, have yet shown by their actions during sleep, that they were very powerfully impelled by their dominion. We have numberless instances of such persons, who, while asleep, have performed many of the ordinary duties to which they have been accustomed when waking; and, with a ridiculous industry, have completed by night what they failed doing by day. We are told, in the German Ephemerides, of a young student who, being enjoined a severe exercise by his tutor, went to bed despairing of accomplishing it. The next morning awaking, to his great surprise, he found the task fairly written out, and finished in his own hand-writing.

He was at first, as the account has it, induced to ascribe this strange production to the operation of an infernal agent; but his tutor, willing to examine the affair to the bottom, set him another exercise still more severe than the former, and took precautions to observe his conduct the whole night. The young gentleman, upon being so severely tasked, felt the same inquietude that he had done on the former occasion; went to bed gloomy and pensive, pondering on the next day's duty, and after some time, fell asleep. But shortly after, his tutor, who continued to observe him from a place that was concealed, was surprised to see him get up, and very deliberately go to the table, where he took out pen, ink, and paper, drew himself a chair, and sat very methodically to thinking: it seems, that his being asleep only served to strengthen the powers of his imagination; for he very quickly and easily went through the task assigned him, put his chair aside, and then returned to bed to take out the rest of his nap. What credit we are to give to this account, I will not pretend to determine; but this may be said, that the book from whence it is taken, has some good marks of veracity; for it is very learned, and very dull, and is written in a country noted, if not for truth, at least for want of invention

The ridiculous history of Arlotto is well known, who has had a volume written, containing a narrative of the actions of his life, not one of which was performed while he was awake. He was an Italian Franciscan friar, extremely rigid in his manners, and remarkably devout and learned in his daily conversation. By night, however, and during his sleep, he played a very different character from what he did by day, and was often detected in very atrocious crimes. He was at one time detected in actually attempting a rape, and did not awake till the next morning, when he was surprised to find himself in the hands of justice. His brothers of the convent often watched him while he went very deliberately into the chapel, and there attempted to commit sacrilege. They sometimes permitted him to carry the chalice and the vestments away into his own chamber, and the next morning amused themselves at the poor man's consternation for what he had done But of all his sleeping transgressions, that was the most ridiculous in which he was called to pray for the soul of a person departed. Arlotto, after having devoutly performed his duty, retired to a chamber which was shown him to rest; but there he had no sooner fallen asleep than he began to reflect that the dead body had got a ring upon one of the fingers, which might be useful to him: accordingly, with a pious resolution of stealing it, he went down, undressed as he was, into a room full of women, and, with great composure, endeavoured to seize the ring. The consequence was, that he was taken before the Inquisition for witchcraft; and the poor creature had like to have been condemned, till his peculiar character accidentally came to be known: however, he was ordered to remain for the rest of life in his own convent, and upon no account whatsoever to stir abroad.

What are we to say of such actions as these: or how account for this operation of the mind in dreaming? It should seem, that the imagination, by day, as well as by night, is always employed; and that, often against our wills, it intrudes where it is least commanded or desired. While awake, and in health, this busy principle cannot much delude us: it may build castles in the air, and raise a thousand phantoms before us; but we have every one of the senses alive to bear testimony to its falsehood. Our eyes show us that the prospect is not present; our hearing and our touch depose against its reality; and our taste and smelling are equally vigilant in detecting the impostor. Reason, therefore, at once gives judgment upon the cause, and the vagrant intruder, Imagination, is imprisoned, or banished from the mind. But in sleep it is otherwise; having, as much as possible, put our senses from their duty, having closed the eyes from seeing, and the ears, taste, and smelling, from their peculiar functions, and having diminished even the touch itself, by all the arts of softness, the imagination is then left to riot at large, and to lead the understanding without an opposer. Every incursive idea then becomes a reality and the mind, not having one power that can prove the illusion, takes them for truths. As in madness, the senses, from struggling with the imagination, are at length forced to submit; so in sleep, they seem for a while soothed into the like submission: the smallest violence exerted upon any one of them, however, rouses all the rest in their mutual defence; and the imagination, that had for a while told its thousand falsehoods, is totally driven away, or only permitted to pass under the custody of such as are every moment ready to detect its imposition.

CHAPTER VII.

OF SEEING.[*]

"HAVING mentioned the senses as correcting the errors of the imagination, and as forcing it, in some measure, to bring us just information, it will naturally follow, that we should examine the nature of those senses themselves: we shall thus be enabled to see how far they also impose on us, and how far they contribute to correct each other. Let it be observed, however, that in this we are neither giving a treatise of optics, or phonics, but an history of our own perceptions: and to those we chiefly confine ourselves."

The eyes very soon begin to be formed in the human embryo, and in the chicken also. Of all the parts which the animal has double, the eyes are produced the soonest, and appear the most prominent. It is true, indeed, that in viviparous animals, and particularly in man, they are not so large in proportion, at first, as in the oviparous kinds; nevertheless, they are more speedily developed, when they begin to appear, than any other parts of the body. It is the same with the organ of hearing; the little bones that compose the internal parts of the ear are entirely formed before the other bones, though much larger, have acquired any part of their growth or solidity. Hence it appears, that those parts of the body which are furnished with the greatest quantity of the nerves, are the first in forming. Thus the brain and the spinal marrow are the first seen begun in the embryo; and, in general, it may be said, that wherever the nerves go, or send their branches in great numbers, there the parts are soonest begun and the most completely finished.

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[*] This chapter is taken from M. Buffon. I believe the reader will readily excuse any apology; and, perhaps, may wish that I had taken this liberty much more frequently. What I add is marked, as in a former instance, with inverted commas.

If we examine the eyes of a child some hours, or even some days after its birth, it will be easily discerned that it, as yet, makes no use of them. The humours of the organ not having acquired a sufficient consistence, the rays of light strike but confusedly upon the retina, or expansion of the nerves at the back of the eye. It is not till about a month after they are born, that children fix them upon objects; for, before that time, they turn them indiscriminately every where, without appearing to be affected by any. At six or seven weeks old, they plainly discover a choice in the objects of their attention; they fix their eyes upon the most brilliant colours, and seem peculiarly desirous of turning them towards the light. Hitherto, however, they only seem to fortify the organ for seeing distinctly; but they have still many illusions to correct.

The first great error in vision is, that the eye inverts every object: and it in reality appears to the child, until the touch has served to undeceive it, turned upside down. A second error in vision is, that every object appears double. The same object forms itself distinctly upon each eye, and is consequently seen twice. This error, also, can only be corrected by the touch; and although, in reality, every object we see appears inverted and double, yet the judgment and habit have so often corrected the sense, that we no longer submit to its imposition, but see every object in its just position, the very instant it appears. Were we, therefore, deprived of feeling, our eyes would not only misrepresent the situation, but also the number of all things around us.

To convince us that we see objects inverted, we have only to observe the manner in which images are represented, coming through a small hole, in a darkened room. If such a small hole be made in a dark room, so that no light can come in, but through it, all the objects without will be painted on the wall behind, but in an inverted position, their heads downwards. For as all the rays which pass from the different parts of the object without, cannot enter the hole in the same extent which they had in leaving the object; since, if so, they would require the aperture to be as large as the object; and, as each part, and every point of the object, sends forth the image of itself on every side, and the rays, which form these images, pass from all points of the object as from so many centres, so such only can pass through the small aperture as come in opposite directions. Thus the little aperture becomes a centre for the entire object; through which the rays from the upper parts, as well as from the lower parts of it, pass in converging directions; and, consequently, they must cross each other in the central point, and thus paint the objects behind, upon the wall, in an inverted position.

It is in like manner easy to conceive, that we see all objects double, whatever our present sensations may seem to tell us to the contrary For, to convince us of this, we have only to compare the situation of any one object on shutting one eye, and then compare the same situation by shutting the other. If, for instance, we hold up a finger, and shut the right eye, we shall find it hide a certain part of the room; if again reshutting the other eye, we shall find that part of the room visible, and the finger seeming to cover a part of the room that had been visible before. If we open both eyes, however, the part covered will appear to lie between the two extremes. But, the truth is, we see the object our finger had covered, one image of it to the right, and the other to the left; but, from habit, suppose that we see but one image placed between both, our sense of feeling having corrected the errors of sight. And thus, also, if instead of two eyes we had two hundred, we should fancy the objects increased in proportion, until our sense had corrected the errors of another.

"The having two eyes might thus be said to be rather an inconvenience than a benefit, since one eye would answer the purposes of sight as well, and be less liable to illusion. But it is otherwise; two eyes greatly contribute, if not to distinct, at least extensive vision.* When an object is placed at a moderate distance, by the means of both eyes we see a larger share of it than we possibly could with one; the right eye seeing a greater portion of its right side, and the left eye of its correspondent side. Thus both eyes, in some measure, see round the object; and it is this that gives it, in nature, that bold relieve, or swelling, with which they appear, and which no painting, how exquisite soever, can attain to. The painter must be contented with shading on a flat surface; but the eyes, in observing nature, do not behold the shading only, but a part of the figure also, that lies behind these very shadings, which gives it that swelling which painters so ardently desire, but can never fully imitate.

"There is another defect, which either of the eyes, taken singly, would have, but which is corrected by having the organ double. In either eye there is a point, which has no vision whatsoever; so that if one of them only is employed in seeing, there is a part of the object to which it is always totally blind. This is that part of the optic nerve where its vein and artery run; which being insensible, that point of the object that is painted there must continue unseen. To be convinced of this, we have only to try a very easy experiment. If we take three black patches, and stick them upon a white wall, about a foot distant from each other, each about as high as the eye that is to observe them; then retiring six or seven feet back, and shutting one eye, by trying for some time, we shall find, that while we distinctly behold the black spots that are to the right and left, that which is in the middle remains totally unseen. Or, in other words, when we bring that part of the eye, where the optic artery runs, to fall upon the object, it will then become invisible. This defect, however, in either eye, is always corrected by both, since the part of the object that is unseen by one, will be very distinctly perceived by the other."

Beside the former defects, we can have no idea of distances from the sight, without the help of touch. Naturally, every object we see appears to be within our eyes; and a child, who has as yet made but little use of the sense of feeling, must suppose that every thing it sees makes a part of itself. Such objects are only seen more or less bulky as they approach or recede from its eyes; so that a fly that is near will appear larger than an ox at a distance. It is experience alone that can rectify this mistake; and a long acquaintance with the real size of every object, quickly assures us of the distance at which it is seen.—The last man in a file of soldiers appears in reality much less, perhaps ten times more diminutive, than the man next to us; however, we do not perceive this difference, but continue to think him of equal stature; for the numbers we have seen thus lessened by distance, and have found, by repeated experience, to be of the natural size when we come closer, instantly corrects the sense, and every object is perceived with nearly its natural proportion. But it is otherwise, if we observe objects in such situations as we have not had sufficient experience to correct the errors of the eye; if, for instance, we look at men from the top of a high steeple, they, in that case, appear very much diminished, as we have not had a habit of correcting the sense in that position.

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* Leonardo da Vinci.

Although a small degree of reflection will serve to convince us of the truth of these positions, it may not be amiss to strengthen them by an authority which cannot be disputed. Mr. Cheselden having couched a boy of thirteen of a cataract, who had hitherto been blind, and thus at once having restored him to sight, curiously marked the progress of his mind upon that occasion. This youth, though he had been till then incapable of seeing, yet was not totally blind, but could tell day from night, as persons in his situation always may. He could also, with a strong light, distinguish black from white, and either from the vivid colour of scarlet: however, he saw nothing of the form of bodies; and, without a bright light, not even colours themselves. He was, at first, couched only in one of his eyes; and when he saw for the first time, he was so far from judging of distances, that he supposed his eyes touched every object that he saw, in the same manner as his hands might be said to feel them. The objects that were most agreeable to him were such as were of plain surfaces and regular figures: though he could as yet make no judgment whatever of their different forms, nor give a reason why one pleased him more than another. Although he could form some idea of colours during his state of blindness, yet that was not sufficient to direct him at present; and he could scarcely be persuaded that the colours he now saw were the same with those he had formerly conceived such erroneous ideas of. He delighted most in green; but black objects, as if giving him an idea of his former blindness, he regarded with horror. He had, as was said, no idea of forms; and was unable to distinguish one object from another, though never so different. When those things were shown him, which he had been formerly familiarized to, by his feeling, he beheld them with earnestness, in order to remember them a second time; but, as he had too many to recollect at once, he forgot the greatest number; and for one he could tell, after seeing, there was a thousand he was totally unacquainted with. He was very much surprised to find, that those things and persons he loved best, were not the most beautiful to be seen; and even testified displeasure in not finding his parents so handsome as he conceived them to be. It was near two months before he could find that a picture resembled a solid body. Till then he only considered it as a flat surface, variously shadowed; but, when he began to perceive that these kind of shadings actually represented human beings, he then began to examine, by his touch, whether they had not the usual qualities of such bodies, and was greatly surprised to find, what he expected a very unequal surface, to be smooth and even. He was then shown a miniature picture of his father, which was contained in his mother's watch-case, and he readily perceived the resemblance; but asked, with great astonishment, how so large a face could be contained in so small a compass? It seemed as strange to him as if a bushel was contained in a pint vessel. At first, he could bear but a very small quantity of light, and he saw every object much greater than the life; but, in proportion as he saw objects that were really large, he seemed to think the former were diminished; and although he knew the chamber where he was contained in the house, yet until he saw the latter, he could not be brought to conceive how a house could be larger than a chamber. Before the operation he had no great expectations from the pleasure he should receive from a new sense; he was only excited by the hopes of being able to read and write; he said, for instance, that he could have no greater pleasure in walking in the garden with his sight, than he had without it, for he walked there at his ease, and was acquainted with all the walks. He remarked also, with great justice, that his former blindness gave him one advantage over the rest of mankind, which was that of being able to walk in the night with confidence and security. But when he began to make use of his new sense, he seemed transported beyond measure. He said that every new object was a new source of delight, and that his pleasure was so great as to be past expression. About a year after, he was brought to Epsom, where there is a very fine prospect, with which he seemed greatly charmed; and he called the landscape before him a new method of seeing. He was couched in the other eye, a year after the former, and the operation succeeded equally well: when he saw with both eyes, he said that objects appeared to him twice as large as when he saw but with one; however, he did not see them doubled, or at least he showed no marks as if he saw them so. Mr. Cheselden mentions instances of many more that were restored to sight in this manner; they all seemed to concur in their perceptions with this youth; and they all seemed particularly embarassed in learning how to direct their eyes to the objects they wished to observe.

In this manner it is that our feeling corrects the sense of seeing, and that objects which appear of very different sizes, at different distances, are all reduced, by experience, to their natural standard. “But not the feeling only, but also the colour, and brightness of the object, contributes, in some measure, to assist us in forming an idea of the distance at which it appears.* Those which we see most strongly marked with light and shade, we readily know to be nearer than those on which the colours are more faintly spread, and that, in some measure, take a part of their hue from the air between us and them. Bright objects, also, are seen at a greater distance than such as are obscure; and, most probably, for this reason, that being less similar in colour to the air which interposes, their impressions are less effaced by it, and they continue more distinctly visible. Thus, a black and distant object is not seen so far off as a bright and glittering one, and a fire by night is seen much farther off than by day."

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* Mr. Buffon gives a different theory, for which I must refer the reader to the original. That I have given, I take to be easy, and satisfactory enough.

The power of seeing objects at a distance is very rarely equal in both eyes. When this inequality is in any great degree, the person so circumstanced then makes use only of one eye, shutting that which sees the least, and employing the other with all its power. And hence proceeds that awkward look which is known by the name of *strabism*.

There are many reasons to induce us to think, that such as are near-sighted see objects larger than other persons; and yet the contrary is most certainly true, for they see them less. Mr. Buffon informs us that he himself is short-sighted, and that his left eye is stronger than his right. He has very frequently experienced, upon looking at any object, such as the letters of a book, that they appear less to the weakest eye; and that when he places the book, so as that the letters appear double, the images of the left eye, which is strongest, are greater than those of the right, which is the most feeble. He has examined several others, who were in similar circumstances, and has always found that the best eye saw every object the largest. This he ascribes to habit; for near-sighted people being accustomed to come close to the object, and view but a small part of it at a time, the habit ensues, when the whole of an object is seen, and it appears less to them than to others.

Infants having their eyes less than those of adults, must see objects also smaller in proportion. For the image formed on the back of the eye will be large, as the eye is capacious; and infants, having it not so great, cannot have so large a picture of the object. This may be a reason also why they are unable to see so distinctly, or at such distances as persons arrived at maturity.

Old men, on the contrary, see bodies close to them very indistinctly, but bodies at a great distance from them with more precision; and this may happen from an alteration in the coats, or, perhaps, humours of the eye; and not, as is supposed, from their diminution. The cornea, for instance, may become too rigid to adapt itself, and take a proper convexity for seeing minute objects; and its very flatness will be sufficient to fit it for distant vision.

When we cast our eyes upon an object extremely brilliant, or when we fix and detain them too long upon the same object, the organ is hurt and fatigued, its vision becomes indistinct, and the image of the body, which has thus too violently, or too perseveringly employed us, is painted upon every thing we look at, and mixes with every object that occurs. "And this is an obvious consequence of the eye taking in too much light, either immediately, or by reflection. Every body exposed to the light, for a time, drinks in a quantity of its rays, which, being brought into darkness, it cannot instantly discharge. Thus the hand, if it be exposed to broad day-light for some time, and then in mediately snatched into a dark room, will appear still luminous: and it will be some time before it is totally darkened. It is thus with the eye; which, either by an instant gaze at the sun, or a steady continuance upon some less brilliant object, has taken in too much light; its humours are, for a while, unfit for vision, until that be discharged, and room made for rays of a milder nature." How dangerous the looking upon bright and luminous objects is to the sight, may be easily seen, from such as live in countries covered for most part of the year with snow, who become generally blind before their time. Travellers who cross these countries, are obliged to wear a crape before their eyes, to save their eyes, which would otherwise be rendered totally unserviceable; and it is equally dangerous in the sandy plains of Africa. The reflection of the light is there so strong, that it is impossible to sustain the effect, without incurring the danger of losing one's sight entirely. Such persons, therefore, as read or write for any continuance, should choose a moderate light, in order to save their eyes; and, although it may seem insufficient at first, the eye will accustom itself to the shade, by degrees, and be less hurt by the want of light than the excess.

"It is, indeed, surprising how far the eye can accommodate itself to darkness, and make the best of a gloomy situation. When first taken from the light, and brought into a dark room, all things disappear; or, if any thing is seen, it is only the remaining radiations that still continue in the eye. But, after a very little time, when these are spent, the eye takes the advantage of the smallest ray that happens to enter; and this alone would, in time, serve for many of the purposes of life. There was a gentleman of great courage and understanding, who was a major under King Charles I.; this unfortunate man, sharing in his master's misfortunes, and being forced abroad, ventured at Madrid to do his king a signal service; but, unluckily, failed in the attempt. In consequence of this, he was instantly ordered to a dark and dismal dungeon, into which the light never entered, and into which there was no opening but by a hole at the top, down which the keeper put his provisions, and presently closed it again on the other side. In this manner the unfortunate loyalist continued for some weeks, distressed and disconsolate; but at last he began to think he saw some little glimmering of light. This internal dawn seemed to increase from time to time, so that he could not only discover the parts of his bed, and such other large objects, but, at length, he even began to perceive the mice that frequented his cell; and saw them as they ran about the floor, eating the crumbs of bread that happened to fall. After some months' confinement he was at last set free; but such was the effect of the darkness upon him, that he could not for some days venture to leave his dungeon, but was obliged to accustom himself by degrees to the light of the day.

CHAPTER VIII

ON HEARING.*

As the sense of hearing, as well as of sight, gives us notice of remote objects, so, like that, it is subject to similar errors, being capable of imposing on us upon all occasions, where we cannot rectify it by the sense of feeling. We can have from it no distinct intelligence of the distance from whence a sounding body is heard; a great noise far off, and a small one very near, produce the same sensation; and, unless we receive information from some other sense, we can never distinctly tell whether the sound be a great or a small one. It is not till we have learned, by experience, that the particular sound which is heard, is of a peculiar kind; then we can judge of the distance from whence we hear it. When we know the tone of the bell, we can then judge how far it is from us.

Every body that strikes against another produces a sound, which is simple, and but one in bodies which are not elastic, but which is often repeated in such as are. If we strike a bell, or a stretched string, for instance, which are both elastic, a single blow produces a sound, which is repeated by the undulations of the sonorous body, and which is multiplied as often as it happens to undulate or vibrate. These undulations each strike their own peculiar blow; but they succeed so fast, one behind the other, that the ear supposes them one continued sound: whereas, in reality, they make many. A person who should, for the first time, hear the toll of the bell, would, very probably, be able to distinguish these breaks of sound; and, in fact, we can readily ourselves perceive an intension and remission in the sound.

In this manner, sounding bodies are of two kinds; those unelastic ones, which being struck, return but a single sound; and those more elastic, returning a succession of sound; which uniting together form a tone. This tone may be considered as a great number of sounds, all produced one after the other, by the same body, as we find in a bell, or the string of a harpsichord, which continues to sound for some time after it is struck. A continuing tone may be also produced from a non-elastic body, by repeating the blow quick and often, as when we beat a drum, or when we draw a bow along the string of a fiddle.

Considering the subject in this light, if we should multiply the number of blows, or repeat them at quicker intervals upon the sounding body, as upon the drum, for instance, it is evident that this will have no effect in altering the tone; it will only make it either more even, or more distinct. But it is otherwise, if we increase the force of the blow: if we strike the body with double weight, this will produce a tone twice as loud as the former. If, for instance, I strike a table with a switch, this will be very different from the sound produced by striking it with a cudgel. Hence, therefore, we may infer, that all bodies give a louder and graver tone, not in proportion to the number of times they are struck, but in proportion to the force that strikes them And, if this be so, those philosophers who make the tone of a sonorous body, of a bell, or the string of a harpsichord, for instance, to depend upon the number only of its vibrations, and not the force, have mistaken what is only an effect for a cause. A bell, or an elastic string, can only be considered as a drum beaten; and the frequency of the blows can make no alteration whatever in the tone. The largest bells, and the longest and thickest strings, have the most forceful vibrations; and, therefore, their tones are the most loud and the most grave.

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* This chapter is taken from Mr. Buffon, except where marked by inverted commas

To know the manner in which sounds thus produced become pleasing, it must be observed, no one continuing tone, how loud and swelling soever, can give us satisfaction; we must have a succession of them, and those in the most pleasing proportion. The nature of this proportion may be thus conceived. If we strike a body incapable of vibration with a double force, or, what amounts to the same thing, with a double mass of matter, it will produce a sound that will be doubly grave. Music has been said, by the ancients, to have been first invented from the blows of different hammers on an anvil. Suppose then we strike an anvil with a hammer of one pound weight, and again with a hammer of two pounds, it is plain that the two pound hammer will produce a sound twice as grave as the former. But if we strike with a two pound hammer, and then with a three pound, it is evident that the latter will produce a sound one third more grave than the former. If we strike the anvil with a three pound hammer, and then with a four pound, it will likewise follow that the latter will be a quarter part more grave than the former. Now, in the comparing between all those sounds, it is obvious that the difference between one and two is more easily perceived, than between two and three, three and four, or any numbers succeeding in the same proportion. The succession of sounds will be, therefore, pleasing in proportion to the ease with which they may be distinguished.—That sound which is double the former, or, in other words, the octave to the preceding tone, will, of all others, be the most pleasing harmony. The next to that, which is as two to three, or, in other words, the third, will be most agreeable. And thus, universally, those sounds whose difference may be most easily compared, are the most agreeable.

"Musicians, therefore, have contented themselves with seven different proportions of sound, which are called *notes*, and which sufficiently answer all the purposes of pleasure. Not but that they might adopt a greater diversity of proportions; and some have actually done so; but, in these, the differences of the proportion are so imperceptible, that the ear is rather fatigued than pleased in making the distinction. In order, however, to give variety, they have admitted half tones; but in all the countries where music is yet in its infancy, they have rejected such; and they can find music in none but the obvious ones. The Chinese, for instance, have neither flats nor sharps in their music; but the intervals between their other notes, are in the same proportion with ours.

"Many more barbarous nations have their peculiar instruments of music; and what is remarkable, the proportion between their notes is in all the same as in ours. This is not the place for entering into the nature of these sounds, their effects upon the air, or their consonances with each other. We are not now giving a history of sound, but of human perception.

"All countries are pleased with music; and if they have not skill enough to produce harmony, at least they seem willing to substitute noise. Without all question, noise alone is sufficient to operate powerfully on the spirits; and, if the mind be already predisposed to joy, I have seldom found noise fail of increasing it into rapture. The mind feels a kind of distracted pleasure in such powerful sounds, braces up every nerve, and riots in the excess. But, as in the eye, an immediate gaze upon the sun will disturb the organs, so, in the ear, a loud unexpected noise disorders the whole frame, and sometimes disturbs the sense ever after. The mind must have time to prepare for the expected shock, and to give its organs the proper tension for its arrival.

"Musical sounds, however, seem of a different kind. Those are generally most pleasing which are most unexpected. It is not from bracing up the nerves, but from the grateful succession of the sounds, that these become so charming. There are few, how indifferent soever, but have at times felt their pleasing impression; and, perhaps, even those who have stood out against the powerful persuasion of sounds, only wanted the proper tune, or the proper instrument, to allure them.

"The ancients give us a thousand strange instances of the effects of music upon men and animals. The story of Arion's harp that gathered the dolphins to the ship side, is well known; and what is remarkable, Schotteus assures us,* that he saw a similar instance of fishes being allured by music. They tell us of diseases that have been cured, unchastity corrected, seditions quelled, passions removed, and sometimes excited even to madness. Dr. Wallis has endeavoured to account for these surprising effects, by ascribing them to the novelty of the art. For my own part, I can scarce hesitate to impute them to the exaggeration of the writers. They are as hyperbolical in the effects of their oratory; and yet, we well know, there is nothing in the orations which they have left us, capable of exciting madness, or of raising the mind to that ungovernable degree of fury which they describe. As they have exaggerated, therefore, in one instance, we may naturally suppose that they have done the same in the other; and, indeed, from the few remains we have of their music, collected by Meibomius, one might be apt to suppose, there was nothing very powerful in what is lost. Nor does any one of the ancient instruments, such as we see them represented in statues, appear comparable to our fiddle.

"However this be, we have many odd accounts, not only among them, but the moderns, of the power of music; and it must not be denied, but that, on some particular occasions, musical sounds may have a very powerful effect. I have seen all the horses and cows in a field, where there were above a hundred, gather round a person that was blowing the French horn, and seeming to testify an awkward kind of satisfaction. Dogs are well known to be very sensible of different tones in music; and I have sometimes heard them sustain a very ridiculous part in a concert, where their assistance was neither expected nor desired.

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* Quod oculis meis spectavi. Schotti Magic. universalis, pars ii. l. 1 p. 28.

"We are told of Henry IV. of Denmark,* that being one day desirous of trying in person whether a musician, who boasted that he could excite men to madness, was not an impostor, he submitted to the operation of his skill: but the consequence was much more terrible than he expected; for, becoming actually mad, he killed four of his attendants in the midst of his transports. A contrary effect of music we have† in the cure of a madman of Alais, in France, by music. This man, who was a dancing master, after a fever of five days, grew furious, and so ungovernable that his hands were obliged to be tied to his sides: what at first was rage, in a short time was converted into silent melancholy, which no arts could exhilirate, nor no medicine remove. In this sullen and dejected state, an old acquaintance accidentally came to inquire after his health; he found him sitting up in bed, tied, and totally regardless of every external object round him. Happening, however, to take up a fiddle that lay in the room, and touching a favourite air, the poor madman instantly seemed to brighten up at the sound; from a recumbent posture, he began to sit up; and, as the musician continued playing, the patient seemed desirous of dancing to the sound; but he was tied, and incapable of leaving his bed, so that he could only humour the tune with his head, and those parts of his arms which were at liberty. Thus the other continued playing, and the dancing-master practised his own art, as far as he was able, for about a quarter of an hour, when suddenly falling into a deep sleep, in which his disorder came to a crisis, he awaked perfectly recovered.

"A thousand other instances might be added, equally true: let it suffice to add one more, which is not true; I mean that of the tarantula. Every person who has been in Italy now well knows that the bite of this animal, and its being cured by music, is all a deception. When strangers come into that part of the country, the country people are ready enough to take money for dancing to the tarantula. A friend of mine had a servant who suffered himself to be bit; the wound, which was little larger than the puncture of a pin, was uneasy for a few hours, and then became well without any farther assistance. Some of the country people, however, still make a tolerable livelihood of the credulity of strangers, as the musician finds his account in it no less than the dancer."

Sounds, like light, are not only extensively diffused, but are frequently reflected. The laws of this reflection, it is true, are not as well understood as those of light; all we know is, that sound is principally reflected by hard bodies; and their being hollow, also, sometimes increases the reverberation. "No art, however, can make an echo; and some who have bestowed great labour and expense upon such a project, have only erected shapeless buildings, whose silence was a mortifying lecture upon their presumption."

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* Olai Magni, l. 15. hist. c. 28

† Hist. de l'Acad. 1708. p. 22.

The internal cavity of the ear seems to be fitted up for the purpose of echoing sound with the greatest precision. This part is fashioned out in the temporal bone, like a cavern cut into a rock. "In this the sound is repeated and articulated; and, as some anatomists tell us, (for we have as yet but very little knowledge on this subject,) is beaten against the tympanum, or drum of the ear, which moves four little bones joined thereto; and these move and agitate the internal air which lies on the other side; and lastly, this air strikes and affects the auditory nerves, which carry the sound to the brain."

One of the most common disorders in old age is deafness, which probably proceeds from the rigidity of the nerves in the labyrinth of the ear. This disorder, also, sometimes proceeds from a stoppage of the wax, which art may easily remedy. In order to know whether the defect be an internal or an external one, let the deaf person put a repeating-watch into his mouth, and if he hears it strike, he may be assured that his disorder proceeds from an external cause, and is, in some measure, curable: "for there is a passage from the ears into the mouth, by what anatomists call the *eustachian tube;* and, by this passage, people often hear sounds, when they are utterly without hearing through the larger channel: and this also is the reason that we often see persons who listen with great attention, hearken with their mouths open, in order to catch all the sound at every aperture."

It often happens that persons hear differently with one ear from the other; and it is generally found that these have what is called by musicians, *a bad ear.* Mr. Buffon, who has made many trials upon persons of this kind, always found that their defect in judging properly of sounds proceeded from the inequality of their ears; and receiving by both at the same time unequal sensations, they form an unjust idea. In this manner, as those people hear falsely, they also, without knowing it, sing false. Those persons also frequently deceive themselves with regard to the side from whence the sound comes, generally supposing the noise to come on the part of the best ear.

Such as are hard of hearing find the same advantage in the trumpet made for this purpose, that short-sighted persons do from glasses. These trumpets might be easily improved, so as to increase sounds, in the same manner that the telescope does objects; however, they could be used to advantage only in a place of solitude and stillness, as the neighbouring sounds would mix with the more distant, and the whole would produce in the ear nothing but tumult and confusion.

Hearing is a much more necessary sense to man than to animals. With these it is only a warning against danger, or an encouragement to mutual assistance. In man, it is the source of most of his pleasures, and without which the rest of his senses would be of little benefit. A man born deaf, must necessarily be dumb; and his whole sphere of knowledge must be bounded only by sensual objects. We have an instance of a young man, who being born deaf, was restored at the age of twenty-four to perfect hearing: the account is given in the Memoires of the Academy of Sciences, 1703, page 18.

A young man of the town of Chartres, between the age of twenty three and twenty-four, the son of a tradesman, and deaf and dum from his birth, began to speak all of a sudden, to the great astonish ment of the whole town. He gave them to understand, that about three or four months before, he had heard the sound of the bells for the first time, and was greatly surprised at this new and unknown sensation. After some time, a kind of water issued from his left ear, and he then heard perfectly well with both. During these three months, he was sedulously employed in listening, without saying a word, and accustoming himself to speak softly (so as not to be heard) the words pronounced by others. He laboured hard also in perfecting himself in the pronunciation, and in the ideas attached to every sound. At length, having supposed himself qualified to break silence, he declared that he could now speak, although as yet but imperfectly. Soon after, some able divines questioned him concerning his ideas of his past state, and principally with respect to God, his soul, the mortality or turpitude of actions. The young man, however, had not driven his solitary speculations into that channel. He had gone to mass indeed with his parents; had learned to sign himself with the cross; to kneel down and assume all the grimaces of a man that was praying; but he did all this without any manner of knowledge of the intention or the cause; he saw others do the like, and that was enough for him; he knew nothing even of death, and it never entered into his head; he led a life of pure animal instinct; entirely taken up with sensible objects, and such as were present, he did not seem even to make as many reflections upon these as might reasonably be expected from his improving situation; and yet the young man was not in want of understanding; but the understanding of a man deprived of all commerce with others, is so very confined, that the mind is in some measure totally under the control of its immediate sensations.

Notwithstanding, it is very possible to communicate ideas to deaf men, which they previously wanted, and even give them very precise notions of some abstract subjects, by means of signs, and of letters. A person born deaf, may, by time, and sufficient pains, be taught to write and read, to speak, and, by the motions of the lips, to understand what is said to him; however, it is probable that, as most of the motions of speech are made within the mouth by the tongue, the knowledge from the motion of the lips is but very confined: "nevertheless, I have conversed with a gentleman thus taught, and in all the commonly occurring questions, and the usual salutations, he was ready enough, merely by attending to the motion of the lips alone. When I ventured to speak for a short continuance, he was totally at a loss, although he understood the subject when written extremely well." Persons taught in this manner, were at first considered as prodigies; but there have been so many instances of success of late, and so many are skilful in the art of instructing in this way, that, though still a matter of some curiosity, it ceases to be an object of wonder.

CHAPTER IX.

OF SMELLING, FEELING, AND TASTING.

An animal may be said to fill up that sphere which he can reach by his senses, and is actually large in proportion to the sphere to which its organ extends. By sight, man's enjoyments are diffused into a wide circle; that of hearing, though less widely diffused, nevertheless extends his powers; the sense of smelling is more contracted still; and the taste and touch are the most confined of all. Thus man enjoys very distant objects but with one sense only; more nearly he brings two senses at once to bear upon them; his sense of smelling assists the other two at its own distance, and of such objects as a man, he may be said to be in perfect possession.

Each sense, however, the more it acts at a distance, the more capable it is of making combinations, and is consequently the more improveable. Refined imaginations, and men of strong minds, take more pleasure, therefore, in improving the delights of the distant senses, than in enjoying such as are scarce capable of improvement.

By combining the objects of the extensive senses, all the arts of poetry, painting, and harmony, have been discovered; but the closer senses, if I may so call them, such as smelling, tasting, and touching, are, in some measure, as simple as they are limited, and admit of little variety. The man of imagination makes a great and an artificial happiness, by the pleasure of altering and combining; the sensualist just stops where he began, and cultivates only those pleasures which he cannot improve. The sensualist is contented with those enjoyments that are already made to his hand; but the man of pleasure is best pleased with growing happiness.

Of all the senses, perhaps, there is not one in which man is more inferior to other animals than in that of smelling. With man, it is a sense that acts in a narrow sphere, and disgusts almost as frequently as it gives him pleasure. With many other animals it is diffused to a very great extent: and never seems to offend them. Dogs not only trace the steps of other animals, but also discover them by the scent at a very great distance; and while they are thus exquisitely sensible of all smells, they seem no way disgusted by any.

But, although this sense is, in general, so very inferior in man, it is much stronger in those nations that abstain from animal food, than among Europeans. The Bramins of India have a power of smelling, as I am informed, equal to what it is in most other creatures. They can smell the water which they drink, that to us seems quite inodorous; and have a word, in their language, which denotes a country of fine water. We are told, also, that the negroes of the Antilles, by the smell alone, can distinguish between the footsteps of a Frenchman and a negro. It is possible, therefore, that we may dull this organ by our luxurious way of living; and sacrifice to the pleasures of taste, those which might be received from perfume.

However, it is a sense that we can, in some measure, dispense with; and I have known many that wanted it entirely, with but very little inconvenience from its loss. In a state of nature it is said to be useful in guiding us to proper nourishment, and deterring us from that which is unwholesome; but, in our present situation, such information is but little wanted; and, indeed, but little attended to. In fact, the sense of smelling gives us very often false intelligence. Many things that have a disagreeable odour, are, nevertheless, wholesome and pleasant to the taste; and such as make eating an art, seldom think a meal fit to please the appetite till it begins to offend the nose. On the other hand, there are many things that smell most gratefully, and yet are noxious, or fatal to the constitution. Some physicians think that perfumes in general are unwholesome; that they relax the nerves, produce head-aches, and even retard digestion. The manchineel apple, which is known to be deadly poison, is possessed of the most grateful odour. Some of those mineral vapours that are often found fatal in the stomach, smell like the sweetest flowers, and continue thus to flatter till they destroy. This sense, therefore, as it should seem, was never meant to direct us in the choice of food, but appears rather as an attendant than a necessary pleasure.

Indeed, if we examine the natives of different countries, or even different natives of the same, we shall find no pleasure in which they differ so widely as that of smelling. Some persons are pleased with the smell of a rose; while I have known others that could not abide to have it approach them. The savage nations are highly delighted with the smell of assafœtida, which is to us the most nauseous stink in nature. It would in a manner seem that our delight in perfumes was made by habit; and that a very little industry could bring us totally to invert the perception of odours.

Thus much is certain, that many bodies which at one distance are an agreeable perfume, when nearer are a most ungrateful odour. Musk and ambergrise, in small quantities, are considered by most persons as highly fragrant; and yet, when in larger masses, their scent is insufferable. From a mixture of two bodies, each whereof is, of itself, void of all smell, a very powerful smell may be drawn. Thus, by grinding quick-lime with sal-ammoniac, may be produced a very fœtid mixture. On the contrary, from a mixture of two bodies, that are separately disagreeable, a very pleasant aromatic odour may be gained. A mixture of aqua-fortis with spirit of wine produces this effect. But not only the alterations of bodies by each other, but the smallest change in us, makes a very great alteration in this sense, and frequently deprives us of it totally. A slight cold often hinders us from smelling; and as often changes the nature of odours. Some persons, from disorder, retain an incurable aversion to those smells which most pleased them before: and many have been known to have an antipathy to some animals, whose presence they instantly perceive by the smell. From all this, therefore, the sense of smelling appears to be an uncertain monitor, easily disordered, and not much missed when totally wanting.

The sense most nearly allied to smelling is that of tasting. This, some have been willing to consider merely as a nicer kind of touch, and have undertaken to account, in a very mechanical manner, for the difference of savours. "Such bodies," said they, "as are pointed, happening to be applied to the papillæ of the tongue, excite a very powerful sensation, and give us the idea of saltness. Such, on the contrary, as are of a rounder figure, slide smoothly along the papillæ, and are perceived to be sweet." In this manner they have, with minute labour, gone through the variety of imagined forms in bodies, and have given them as imaginary effects. All we can precisely determine upon the nature of tastes is, that the bodies to be tasted must be either somewhat moistened, or, in some measure, dissolved by the saliva, before they can produce a proper sensation: when both the tongue itself, and the body to be tasted, are extremely dry, no taste whatever ensues. The sensation is then changed; and the tongue, instead of tasting, can only be said, like any other part of the body, to feel the object.

It is for this reason that children have a stronger relish of tastes than those who are more advanced in life. This organ with them, from the greater moisture of their bodies, is kept in greater perfection; and is, consequently, better adapted to perform its functions. Every person remembers how great a pleasure he found in sweets, while a child; but his taste growing more obtuse with age, he is obliged to use artificial means to excite it. It is then that he is found to call in the assistance of poignant sauces, and strong relishes of salts and aromatics; all which the delicacy of his tender organ, in childhood, were unable to endure. His taste grows callous to the natural relishes, and is artificially formed to others more unnatural; so that the highest epicure may be said to have the most depraved taste; as it is owing to the bluntness of his organ, that he is obliged to have recourse to such a variety of expedients to gratify his appetite.

As smells are often rendered agreeable by habit, so also tastes may be. Tobacco and coffee, so pleasing to many, are yet, at first, very disagreeable to all. It is not without perseverance that we begin to have a relish for them; we force nature so long, that what was constraint in the beginning, at last becomes inclination.

The grossest, and yet the most useful of all the senses, is that of feeling. We are often seen to survive under the loss of the rest; but of this we can never be totally deprived, but with life. Although this sense is diffused over all parts of the body, yet it most frequently happens that those parts which are most exercised in touching, acquire the greatest degree of accuracy. Thus the fingers, by long habit, become greater masters in the art than any others, even where the sensation is more delicate and fine.[*] It is from this habit, therefore, and their peculiar formation, and not, as is supposed, from their being furnished with a greater quantity of nerves, that the fingers are thus perfectly qualified to judge of forms. Blind men, who are obliged to use them much oftener, have this sense much finer; so that the delicacy of the touch arises rather from the habit of constantly employing the fingers, than from any fancied nervousness in their conformation.

All animals that are furnished with hands[†] seem to have more understanding than others. Monkeys have so many actions like those of men, that they appear to have similar ideas of the form of bodies

[*] Buffon, vol. vi. p. 80.

[†] Ibid. vol. v. p. 92

All other creatures, deprived of hands, can have no distinct ideas of the shape of the objects by which they are surrounded, as they want this organ, which serves to examine and measure their forms, their risings, and depressions. A quadruped, probably, conceives as erroneous an idea of any thing near him, as a child would of a rock or a mountain that it beheld at a distance. It may be for this reason, that we often see them frighted at things with which they ought to be better acquainted. Fishes, whose bodies are covered with scales, and who have no organs for feeling, must be the most stupid of all animals. Serpents, that are likewise destitute, are yet, by winding round several bodies, better capable of judging of their form. All these, however, can have but very imperfect ideas from feeling; and we have already seen, when deprived of this sense, how little the rest of the senses are to be relied on.

The feeling, therefore, is the guardian, the judge, and the examiner of all the rest of the senses. It establishes their information, and detects their errors. All the other senses are altered by time, and contradict their former evidence; but the touch still continues the same; and, though extremely confined in its operations, yet it is never found to deceive. The universe, to a man who had only used the rest of his senses, would be but a scene of illusion; every object misrepresented, and all its properties unknown. Mr. Buffon has imagined a man just newly brought into existence, describing the illusion of his first sensations, and pointing out the steps by which he arrived at reality. He considers him as just created, and awaking amidst the productions of nature; and, to animate the narrative still more strongly, has made his philosophical man a speaker. The reader will no doubt recollect Adam's speech in Milton as being similar. All that I can say to obviate the imputation of plagiarism is, that the one treats the subject more as a poet, the other more as a philosopher. The philosopher's man describes his first sensations in the following manner.*

I well remember that joyful anxious moment when I first became acquainted with my own existence. I was quite ignorant of what I was, how I was produced, or from whence I came. I opened my eyes: what an addition to my surprise! the light of the day, the azure vault of heaven, the verdure of the earth, the crystal of the waters, all employed me at once, and animated and filled me with inexpressible delight. I at first imagined that all those objects were within me, and made a part of myself.

Impressed with this idea, I turned my eyes to the sun; its splendour dazzled and overpowered me; I shut them once more; and, to my great concern, I supposed that during this short interval of darkness, I was again returning to nothing.

Afflicted, seized with astonishment, I pondered a moment on this great change, when I heard a variety of unexpected sounds. The whistling of the wind, and the melody of the groves, formed a concert, the soft cadence of which sunk upon my soul. I listened for some time, and was persuaded that all this music was within me.

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* Buffon, vol. vi. p. 88.

Quite occupied with this new kind of existence, I had already forgotten the light which was my first inlet into life; when I once more opened my eyes, and found myself again in possession of my former happiness. The gratification of the two senses at once, was a pleasure too great for utterance.

I turned my eyes upon a thousand various objects; I soon found that I could lose them, and restore them at will; and amused myself more at leisure with a repetition of this new-made power.

I now began to gaze without emotion, and to hearken with tranquillity, when a light breeze, the freshness of which charmed me, wafted its perfumes to my sense of smelling, and gave me such satisfaction as even increased my self-love.

Agitated, roused by the various pleasures of my new existence, I instantly arose, and perceived myself moved along, as if by some unknown and secret power.

I had scarce proceeded forward, when the novelty of my situation once more rendered me immoveable. My surprise returned; I supposed that every object around me had been in motion: I gave to them that agitation which I produced by changing place; and the whole creation seemed once more in disorder.

I lifted my hand to my head; I touched my forehead; I felt my whole frame; I then supposed that my hand was the principal organ of my existence; all its informations were distinct and perfect; and so superior to the senses I had yet experienced, that I employed myself for some time in repeating its enjoyments: every part of my person I touched, seemed to touch my hand in turn, and gave back sensation for sensation.

I soon found that this faculty was expanded over the whole surface of my body; and I now first began to perceive the limits of my existence, which I had in the beginning supposed spread over all the objects I saw.

Upon casting my eyes upon my body, and surveying my own form, I thought it greater than all the objects that surrounded me. I gazed upon my person with pleasure; I examined the formation of my hand, and all its motions; it seemed to me large or little in proportion as I approached it to my eyes; I brought it very near, and it then hid almost every other object from my sight. I began soon, however, to find that my sight gave me uncertain information, and resolved to depend upon my feeling for redress.

This precaution was of the utmost service; I renewed my motions, and walked forward with my face turned towards the heavens. I happened to strike lightly against a palm-tree, and this renewed my surprise: I laid my hand on this strange body; it seemed replete with new wonders, for it did not return me sensation for sensation, as my former feelings had done. I perceived that there was something external, and which did not make a part of my own existence.

I now, therefore, resolved to touch whatever I saw, and vainly attempted to touch the sun; I stretched forth my arm, and felt only yielding air: at every effort, I fell from one surprise into another, for every object appeared equally near me; and it was not till after an infinity of trials that I found some objects farther removed than the rest

Amazed with the illusions, and the uncertainty of my state, I sat down beneath a tree; the most beautiful fruits hung upon it, within my reach; I stretched forth my hand, and they instantly separated from the branch. I was proud of being able to grasp a substance without me; I held them up, and their weight appeared to me like an animated power that endeavoured to draw them to the earth. I found a pleasure in conquering their resistance.

I held them near my eye; I considered their form and beauty; their fragrance still more allured me to bring them nearer; I approached them to my lips, and drank in their odours; the perfume invited my sense of tasting, and I soon tried a new sense—How new! how exquisite! Hitherto I had tasted only of pleasure; but now it was luxury. The power of tasting gave me the idea of possession.

Flattered with this new acquisition, I continued its exercise, till an agreeable languor stealing upon my mind, I felt all my limbs become heavy, and all my desires suspended. My sensations were now no longer vivid and distinct; but seemed to lose every object, and presented only feeble images, confusedly marked. At that instant I sunk upon the flowery bank, and slumber seized me. All now seemed once more lost to me. It was then as if I was returning into my former nothing. How long my sleep continued, I cannot tell; as I yet had no perception of time. My awaking appeared like a second birth; and I then perceived that I had ceased for a time to exist. This produced a new sensation of fear; and from this interruption in life, I began to conclude that I was not formed to exist for ever.

In this state of doubt and perplexity, I began to harbour new suspicions; and to fear that sleep had robbed me of some of my late powers; when, turning on one side, to resolve my doubts, what was my amazement, to behold another being, like myself, stretched by my side! New ideas now began to arise: new passions, as yet unperceived, with fears, and pleasures, all took possession of my mind, and prompted my curiosity; love served to complete that happiness which was begun in the individual; and every sense was gratified in all its varieties.

CHAPTER X.

OF OLD AGE AND DEATH.*

Every thing in nature has its improvement and decay. The human form is no sooner arrived at its state of perfection, than it begins to decline. The alteration is, at first, insensible; and, often, several years are elapsed before we find ourselves grown old. The news of this disagreeable change too generally comes from without; and we learn from others that we grow old, before we are willing to believe the report.

When the body has come to its full height, and is extended into its just dimensions, it then also begins to receive an additional bulk, which rather loads than assists it. This is formed from fat; which generally, at the age of thirty-five or forty, covers all the muscles, and interrupts their activity. Every action is then performed with greater labour, and the increase of size only serves as a forerunner of decay.

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* This chapter is taken from Mr. Buffon, except where it is marked by inverted commas.

The bones, also, become every day more solid. In the embryo they are as soft almost as the muscles of the flesh; but, by degrees, they harden, and acquire their natural vigour; but still, however, the circulation is carried on through them, and, how hard soever the bones may seem, yet the blood holds its current through them as through all other parts of the body. Of this we may be convinced, by an experiment, which was first accidentally discovered by our ingenious countryman Mr. Belcher. Perceiving at a friend's house, that the bones of hogs, which were fed upon madder, were red, he tried it upon various animals by mixing this root with their usual food; and he found that it tinctured the bones in all; an evident demonstration that the juices of the body had a circulation through the bones. He fed some animals alternately upon madder and their common food, for some time, and he found their bones tinctured with alternate layers, in conformity to their manner of living. From all this he naturally concluded, that the blood circulated through the bones, as it does through every other part of the body; and that, how solid soever they seemed, yet, like the softest parts, they were furnished through all their substance with their proper canals. Nevertheless, these canals are of very different capacities, during the different stages of life. In infancy they are capacious; and the blood flows almost as freely through the bones as through any other part of the body; in manhood their size is greatly diminished; the vessels are almost imperceptible; and the circulation through them is proportionably slow. But, in the decline of life, the blood, which flows through the bones, no longer contributing to their growth, must necessarily serve to increase their hardness. The channels that every where run through the human frame, may be compared to those pipes that we every where see crusted on the inside, by the water, for a long continuance, running through them. Both every day grow less and less, by the small rigid particles which are deposited within them. Thus as the vessels are by degrees diminished, the juices also, which were necessary for the circulation through them, are diminished in proportion; till at length, in old age, those props of the human frame are not only more solid but more brittle.

The cartilages, or gristles, which may be considered as bones beginning to be formed, grow also more rigid. The juices circulating through them, for there is a circulation through all parts of the body, every day contributes to render them harder; so that these substances, which in youth are elastic and pliant, in age become hard and bony As these cartilages are generally placed near the joints, the motion of the joints also must, of consequence, become more difficult. Thus, in old age, every action of the body is performed with labour; and the cartilages, formerly so supple, will now sooner break than bend.

" As the cartilages acquire hardness, and unfit the joints for motion, so also, that mucous liquor, which is always separated between the joints, and which serves, like oil to a hinge, to give them an easy and ready play, is now grown more scanty. It becomes thicker, and more clammy, more unfit for answering the purposes of motion; and from thence, in old age, every joint is not only stiff, but awkward. At every motion, this clammy liquor is heard to crack; and it is not without the greatest efforts of the muscles that its resistance is overcome. I have seen an old person, who never moved a single joint, that did not thus give notice of the violence done to it."

The membranes that cover the bones, the joints, and the rest of the body, become, as we grow old, more dense and more dry. These which surround the bones, soon cease to be ductile. The fibres, of which the muscles or flesh is composed, become every day more rigid; and, while to the touch the body seems, as we advance in years, to grow softer, it is, in reality, increasing in hardness. It is the skin, and not the flesh, that we feel upon such occasions. The fat, and the flabbiness of that, seems to give an appearance of softness, which the flesh itself is very far from having. There are few can doubt this, after trying the difference between the flesh of young and old animals. The first is soft and tender, the last is hard and dry.

The skin is the only part of the body that age does not contribute to harden. That stretches to every degree of tension; and we have horrid instances of its pliancy, in many disorders incident to humanity In youth, therefore, while the body is vigorous and increasing, it still gives way to its growth. But, although it thus adapts itself to our increase, it does not in the same manner conform to our decay. The skin, which in youth was filled and glossy, when the body begins to decline, has not elasticity enough to shrink entirely with its diminution. It hangs, therefore, in wrinkles, which no art can remove. The wrinkles of the body, in general, proceed from this cause. But those of the face seem to proceed from another; namely, from the many varieties of positions into which it is put by the speech, the food, or the passions. Every grimace, and every passion, wrinkles up the visage into different forms. These are visible enough in young persons; but what at first was accidental, or transitory, becomes unalterably fixed in the visage as it grows older. "From hence we may conclude, that a freedom from passions not only adds to the happiness of the mind, but preserves the beauty of the face; and the person that has not felt their influence, is less strongly marked by the decays of nature."

Hence, therefore, as we advance in age, the bones, the cartilages, the membranes, the flesh, the skin, and every fibre of the body, become more solid, more brittle, and more dry. Every part shrinks, every motion becomes more slow; the circulation of the fluids is performed with less freedom; perspiration diminishes; the secretions alter; the digestion becomes slow and laborious; and the juices no longer serving to convey their accustomed nourishment, those parts may be said to live no longer when the circulation ceases. Thus the body dies by little and little; all its functions are diminished by degrees; life is driven from one part of the frame to another; universal rigidity prevails; and death at last seizes upon the little that is left.

As the bones, the cartilages, the muscles, and all other parts of the body, are softer in women than in men, these parts must, of consequence, require a longer time to come to that hardness which hastens death. Women, therefore, ought to be a longer time in growing old than men; and this is actually the case. If we consult the tables which have been drawn up respecting human life, we shall find, that, after a certain age, they are more long-lived than men, all other circumstances the same. A woman of sixty has a better chance than a man of the same age to live till eighty. Upon the whole, we may infer, that such persons as have been slow in coming up to maturity, will also be slow in growing old; and this holds as well with regard to other animals as to man.

The whole duration of the life of either vegetables or animals may be, in some measure, determined from their manner of coming to maturity. The tree, or the animal, which takes but a short time to increase to its utmost pitch, perishes much sooner than such as are less premature. In both, the increase upwards is first accomplished; and not till they have acquired their greatest degree of height do they begin to spread in bulk. Man grows in stature till about the age of seventeen; but his body is not completely developed till about thirty. Dogs, on the other hand, are at their utmost size in a year, and become as bulky as they usually are in another. However, man, who is so long in growing, continues to live fourscore, or a hundred years; but the dog seldom above twelve or thirteen. In general, also, it may be said, that large animals live longer than little ones, as they usually take a longer time to grow. But in all animals, one thing is equally certain, that they carry the causes of their own decay about them; and that their deaths are necessary and inevitable. The prospects which some visionaries have formed of perpetuating life by remedies, have been often enough proved false by their own example. Such unaccountable schemes would, therefore, have died with them, had not the love of life always augmented our credulity.

When the body is naturally well formed, it is possible to lengthen out the period of life for some years by management. Temperance in diet is often found conducive to this end. The famous Cornaro, who lived to above a hundred years, although his constitution was naturally feeble, is a strong instance of the benefit of an abstemious life. Moderation in the passions also may contribute to extend the term of our existence. "Fontenelle, the celebrated writer, was naturally of a very weak and delicate habit of body. He was affected by the smallest irregularities; and had frequently suffered severe fits of illness from the slightest causes. But the remarkable equality of his temper, and his seeming want of passion, lengthened out his life to above a hundred. It was remarkable of him, that nothing could vex or make him uneasy; every occurrence seemed equally pleasing; and no event, however unfortunate, seemed to come unexpected." However, the term of life can be prolonged but for a very little time by any art we can use. We are told of men who have lived beyond the ordinary duration of human existence; such as Parr, who lived to a hundred and forty-four; and Jenkins to a hundred and sixty-five; yet these men used no peculiar arts to prolong life; on the contrary, it appears that these, as well as some others, remarkable for their longevity, were peasants accustomed to the greatest fatigues, who had no settled rules of diet, but who often indulged in accidental excesses. Indeed, if we consider that the European, the Negro, the Chinese, and the American, the civilized man and the savage, the rich and the poor, the inhabitant of the city and of the country, though all so different in other respects, are yet entirely similar in the period allotted them for living; if we consider that neither the difference of race, of climate, of nourishment, of convenience, or of soil, makes any difference in the term of life; if we consider that those men who live upon raw flesh or dried fishes, upon sago or rice, upon cassava or upon roots, nevertheless live as long as those who are fed upon bread and meat, we shall readily be brought to acknowledge, that the duration of life depends neither upon habit, customs, nor the quantity of food; we shall confess, that nothing can change the laws of that mechanism which regulates the number of our years, and which can chiefly be affected only by long fasting or great excess.

If there be any difference in the different periods of man's existence, it ought principally to be ascribed to the quality of the air. It has been observed, that in elevated situations there have been found more old people than in those that were low. The mountains of Scotland, Wales, Auvergne, and Switzerland, have furnished more instances of extreme old age, than the plains of Holland, Flanders, Germany, or Poland. But, in general, the duration of life is nearly the same in most countries. Man, if not cut off by accidental diseases, is often found to live to ninety or a hundred years. Our ancestors did not live beyond that date; and, since the times of David, this term has undergone little alteration.

If we be asked, how in the beginning men lived so much longer than at present, and by what means their lives were extended to nine hundred and thirty, or even nine hundred and sixty years; it may be answered, that the productions of the earth, upon which they fed, might be of a different nature at that time from what they are at present. "It may be answered, that the term was abridged by Divine command, in order to keep the earth from being overstocked with human inhabitants; since, if every person were now to live and generate for nine hundred years, mankind would be increased to such a degree, that there would be no room for subsistence: so that the plan of Providence would be altered; which is seen not to produce life, without providing a proper supply."

But to whatever extent life may be prolonged, or however some may have delayed the effects of age, death is the certain goal to which all are hastening. All the causes of decay which have been mentioned, contribute to bring on this dreaded dissolution. However, nature approaches to this awful period by slow and imperceptible degrees; life is consuming day after day; and some one of our faculties, or vital principles, is every hour dying before the rest; so that death is only the last shade in the picture; and it is probable that man suffers a greater change in going from youth to age, than from age into the grave. When we first begin to live, our lives may scarcely be said to be our own; as the child grows, life increases in the same proportion; and is at its height in the prime of manhood. But as soon as the body begins to decrease, life decreases also; for, as the human frame diminishes, and its juices circulate in smaller quantity, life diminishes and circulates with less vigour; so that as we begin to live by degrees, we begin to die in the same manner.

Why then should we fear death, if our lives have been such as not to make eternity dreadful? Why should we fear that moment, which is prepared by a thousand other moments of the same kind? the first pangs of sickness being probably greater than the last struggles of departure. Death, in most persons, is as calmly endured as the disorder that brings it on. If we inquire from those whose business it is to attend the sick and the dying, we shall find that, except in a very few acute cases, where the patient dies in agonies, the greatest number die quietly, and seemingly without pain: and even the agonies of the former rather terrify the spectators than torment the patient; for how many have we not seen who have been accidentally relieved from this extremity, and yet had no memory of what they then endured? In fact, they had ceased to live, during that time when they ceased to have sensation; and their pains were only those of which they had an idea.

The greatest number of mankind die, therefore, without sensation; and of those few that still preserve their faculties entire to the last moment, there is scarce one of them that does not also preserve the hopes of still out-living his disorder. Nature, for the happiness of man, has rendered this sentiment stronger than his reason. A person dying of an incurable disorder, which he must know to be so, by frequent examples of his case, which he perceives to be so, by the inquietude of all around him, by the tears of his friends, and the departure or the face of the physician, is, nevertheless, still in hopes of getting over it. His interest is so great, that he only attends to his own representations; the judgment of others is considered as a hasty conclusion, and while death every moment makes new inroads upon his constitution, and destroys life in some part, hope still seems to escape the universal ruin, and is the last that submits to the blow.

Cast your eyes upon a sick man, who has a hundred times told you that he felt himself dying—that he was convinced he could not recover, and that he was ready to expire; examine what passes on his visage, when, through zeal or indiscretion, any one comes to tell him that his end is at hand. You will see him change, like one who is told an unexpected piece of news. He now appears not to have thoroughly believed what he had been telling you himself; he doubted much, and his fears were greater than his hopes; but he still had some feeble expectations of living, and would not have seen the approaches of death, unless he had been alarmed by the mistaken assiduity of his attendants.

Death, therefore, is not that terrible thing which we suppose it to be. It is a spectre which frights us at a distance, but which disappears when we come to approach it more closely. Our ideas of its terrors are conceived in prejudice, and dressed up by fancy: we regard it not only as the greatest misfortune, but as also an evil accompanied with the most excruciating tortures: we have even increased our apprehensions, by reasoning on the extent of our sufferings. "It must be dreadful," say some, "since it is sufficient to separate the soul from the body; it must be long, since our sufferings are proportioned to the succession of our ideas; and these being painful, must succeed each other with extreme rapidity." In this manner has false philosophy laboured to augment the miseries of our nature; and to aggravate that period, which Nature has kindly covered with insensibility. Neither the mind nor the body can suffer these calamities; the mind is at that time mostly without ideas, and the body too much enfeebled, to be capable of perceiving its pain. A very acute pain produces either death, or fainting, which is a state similar to death: the body can suffer but to a certain degree; if the torture becomes excessive, it destroys itself; and the mind ceases to perceive, when the body can no longer endure.

In this manner excessive pain admits of no reflection; and wherever there are any signs of it, we may be sure that the sufferings of the patient are no greater than what we ourselves may have remembered to endure.

But, in the article of death, we have many instances in which the dying person has shown that very reflection which presupposes an absence of the greatest pain, and consequently that pang which ends life, cannot even be so great as those which have preceded. Thus, when Charles XII. was shot at the siege of Fredrickshaldt, he was seen to clap his hand on the hilt of his sword; and although the blow was great enough to terminate one of the boldest and bravest lives in the world, yet it was not painful enough to destroy reflection. He perceived himself attacked; he reflected that he ought to defend himself, and his body obeyed the impulse of his mind, even in the last extremity. Thus it is the prejudice of persons in health, and not the body in pain, that makes us suffer from the approach of death: we have all our lives contracted a habit of making out excessive pleasures and pains; and nothing but repeated experience shows us how seldom the one can be suffered, or the other enjoyed, to the utmost.

If there be any thing necessary to confirm what we have said concerning the gradual cessation of life, or the insensible approaches of our end, nothing can more effectually prove it, than the uncertainty of the signs of death. If we consult what Winslow or Bruhier have said upon this subject, we shall be convinced, that between life and death, the shade is so very undistinguishable, that even all the powers of art can scarcely determine where the one ends, and the other begins. The colour of the visage, the warmth of the body, the suppleness of the joints, are but uncertain signs of life still subsisting; while, on the contrary, the paleness of the complexion, the coldness of the body, the stiffness of the extremities, the cessation of all motion, and the total insensibility of the parts, are but uncertain marks of death begun. In the same manner, also, with regard to the pulse and the breathing, these motions are often so kept under, that it is impossible to perceive them. By approaching a looking-glass to the mouth of the person supposed to be dead, people often expect to find whether he breathes or not. But this is a very uncertain experiment; the glass is frequently sullied by the vapour of the dead man's body, and often the person is still alive, although the glass is no way tarnished In the same manner, neither burning nor scarifying, neither noises in the ears nor pungent spirits applied to the nostrils, give certain signs of the discontinuance of life; and there are many instances of persons who have endured them all, and afterwards recovered without any external assistance, to the astonishment of the spectators. How careful, therefore, should we be, before we commit those who are dearest to us to the grave, to be well assured of their departure: experience, justice, humanity, all persuade us not to hasten the funerals of our friends, but to keep their bodies unburied until we have certain signs of their real decease.

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CHAPTER XI.

OF THE VARIETIES IN THE HUMAN RACE.

Hitherto we have compared man with other animals; we now come to compare men with each other. We have hitherto considered him as an individual, endowed with excellencies above the rest of the creation; we now come to consider the advantages which men have over men, and the various kinds with which our earth is inhabited.

If we compare the minute differences of mankind, there is scarce one nation upon the earth that entirely resembles another; and there may be said to be as many different kinds of men as there are countries inhabited. One polished nation does not differ more from another, than the merest savages do from those savages that lie even contiguous to them; and it frequently happens that a river, or a mountain, divides two barbarous tribes that are unlike each other in manners, customs, features, and complexion. But these differences, however perceivable, do not form such distinctions as come within a general picture of the varieties of mankind. Custom, accident, or fashion, may produce considerable alterations in neighbouring nations; their being derived from ancestors of a different climate, or complexion, may contribute to make accidental distinctions, which every day grow less; and it may be said, that two neighbouring nations, how unlike soever at first, will assimilate by degrees; and, by long continuance, the difference between them will at last become almost imperceptible. It is not, therefore, between contiguous nations we are to look for any strong marked varieties in the human species: it is by comparing the inhabitants of opposite climates and distant countries; those who live within the polar circle with those beneath the equator; those that live on one side of the globe with those that occupy the other.

Of all animals, the differences between mankind are the smallest. Of the lower races of creatures, the changes are so great as often entirely to disguise the natural animal, and to distort, or to disfigure its shape. But the chief differences in man are rather taken from the tincture of his skin than the variety of his figure; and in all climates he preserves his erect deportment, and the marked superiority of his form. If we look round the world, there seems to be not above six[*] distinct varieties in the human species, each of which is strongly marked, and speaks the kind seldom to have mixed with any other. But there is nothing in the shape, nothing in the faculties, that shows their coming from different originals; and the varieties of climate, of nourishment, and custom, are sufficient to produce every change.

The first distinct race of men is found round the polar regions. The Laplanders, the Esquimaux Indians, the Samoeid Tartars, the inhabitants of Nova Zembla, the Borandians, the Greenlanders, and the natives of Kamtschatka, may be considered as one peculiar race of people, all greatly resembling each other in their stature, their complexion, their customs, and their ignorance. These nations being under a rigorous climate, where the productions of nature are but few, and the provisions coarse and unwholesome, their bodies have shrunk to the nature of their food; and their complexions have suffered from cold almost a similar change to what heat is known to produce; their colour being a deep brown, in some places inclining to actual blackness. These, therefore, in general, are found to be a race of short stature and odd shape, with countenances as savage as their manners are barbarous. The visage, in these countries, is large and broad, the nose flat and short, the eyes of a yellowish brown, inclining to blackness, the eye-lids drawn towards the temples, the cheek-bones extremely high, the mouth very large, the lips thick, and turned outwards, the voice thin and squeaking, the head large, the hair black and straight, the colour of the skin of a dark grayish.[†] They are short in stature, the generality not being above four feet high, and the tallest not above five. Among all these nations the women are as deformed as the men, and resemble them so nearly, that one cannot at first distinguish the sexes among them.

These nations not only resemble each other in their deformity, their dwarfishness, the colour of their hair and eyes, but they have, in a great measure, the same inclinations, and the same manners, being all equally rude, superstitious, and stupid. The Danish Laplanders have a large black cat, to which they communicate their secrets, and consult in all their affairs. Among the Swedish Laplanders there is in every family a drum for consulting the devil; and although these nations are robust and nimble, yet they are so cowardly that they never can be brought into the field. Gustavus Adolphus attempted to form a regiment of Laplanders, but he found it impossible to accomplish his design; for it should seem that they can live only in their own country, and in their own manner. They make use of skates, which are made of fir, of near three feet long, and half a foot broad; these are pointed, and raised before, and tied to the foot by straps of leather. With these they skate upon the icy snow with such velocity that they very easily overtake the swiftest animals. They make use also of a pole, pointed with iron at one end, and rounded at the other. This pole serves to push them along, to direct their course, to support them from falling, to stop the impetuosity of their motion, and to kill that game which they have overtaken. Upon these skates they descend the steepest mountains, and scale the most craggy precipices; and in these exercises the women are not less skillful than the men. They have all the use of the bow and arrow, which seems to be a contrivance common to all barbarous nations; and which, however, at first required no small skill to invent. They launch a javelin also, with great force, and some say that they can hit a mark no larger than a crown, at thirty yards distance, and with such force as would pierce a man through. They are all hunters, and particularly pursue the ermine, the fox, the ounce, and the martin, for the sake of their skins. These they barter with their southern neighbours for brandy and tobacco; both which they are fond of to excess. Their food is principally dried fish, the flesh of rein-deer and bears. Their bread is composed of the bones of fishes, pounded and mixed with the inside tender bark of the pine-tree. Their drink is train-oil, or brandy; and when deprived of these, water in which juniper berries have been infused. With regard to their morals, they have all the virtues of simplicity, and all the vices of ignorance. They offer their wives and daughters to strangers, and seem to think it a particular honour if their offer be accepted. They have no idea of religion, or a Supreme Being; the greatest number of them are idolaters; and their superstition is as profound as their worship is contemptible. Wretched and ignorant as they are, yet they do not want pride; they set themselves far above the rest of mankind; and Krantz assures us, that when the Greenlanders are got together, nothing is so customary among them as to turn the Europeans into ridicule. They are obliged, indeed, to yield them the pre-eminence in understanding and mechanic arts; but they do not know how to set any value upon these. They therefore count themselves the only civilized and well-bred people in the world; and it is common with them, when they see a quiet, or a modest stranger, to say that he is almost as well-bred as a Greenlander.

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[*] I have taken four of these varieties from Linnæus; those of the Laplanders and Tartars, from Mr. Buffon.

[†] Krantz.

From this description, therefore, this whole race of people may be considered as distinct from any other. Their long continuance in a climate the most inhospitable, their being obliged to subsist on food the most coarse and ill prepared, the savageness of their manners, and their laborious lives, all have contributed to shorten their stature, and to deform their bodies.* In proportion as we approach towards the north pole, the size of the natives appears to diminish, growing less and less as we advance higher, till we come to those latitudes that are destitute of all inhabitants whatsoever.

The wretched natives of these climates seem fitted by Nature to endure the rigours of their situation. As their food is but scanty and precarious, their patience in hunger is amazing.† A man who has eaten nothing for four days, can manage his little canoe in the most furious waves, and calmly subsist in the midst of a tempest that would quickly dash an European boat to pieces. Their strength is not less amazing than their patience; a woman among them will carry a piece of timber, or a stone, near double the weight of what an European can lift. Their bodies are of a dark gray all over; and their faces brown, or olive. The tincture of their skins partly seems to arise from their dirty manner of living, being generally daubed with train-oil; and partly from the rigours of climate, as the sudden alterations of cold and raw air in winter, and of burning heats in summer, shade their complexions by degrees, till, in a succession of generations, they at last become almost black. As the countries in which these reside are the most barren, so the natives seem the most barbarous of any part of the earth. Their more southern neighbours of America treat them with the same scorn that a polished nation would treat a savage one; and we may readily judge of the rudeness of those manners, which even a native of Canada can think more barbarous than his own.

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* Ellis's Voyage, p. 256.

† Krantz, p. 134. vol. i.

But the gradations of nature are imperceptible; and while the north is peopled with such miserable inhabitants, there are here and there to be found upon the edges of these regions, people of larger stature, and completer figure. A whole race of dwarfish breed is often found to come down from the north, and settle more to the southward; and on the contrary it sometimes happens that southern nations are seen higher up, in the midst of these diminutive tribes, where they have continued for time immemorial. Thus the Ostiac Tartars seem to be a race that have travelled down from the north, and to be originally sprung from the minute savages we have been describing. There are also Norwegians and Finlanders, of proper stature, who are seen to inhabit in latitudes higher even than Lapland. These, however, are but accidental migrations, and serve as shades to unite the distinct varieties of mankind.

The second great variety in the human species seems to be that of the Tartar race; from whence, probably, the little men we have been describing originally proceeded. The Tartar country, taken in general, comprehends the greatest part of Asia; and is consequently a general name given to a number of nations of various forms and complexions. But however they seem to differ from each other, they agree in being very unlike the people of any other country. All these nations have the upper part of the visage very broad, and wrinkled even while yet in their youth. Their noses are short and flat; their eyes little and sunk in their heads; and in some of them they are seen five or six inches asunder. Their cheek-bones are high, the lower part of their visage narrow, the chin long and advanced forward, their teeth of an enormous size, and growing separate from each other; their eye-brows thick, large, and covering their eyes; their eyelids thick, the face broad and flat, the complexion olive-coloured, and the hair black. They are of a middle size, extremely strong, and very robust. They have but little beard, which grows stragglingly on the chin. They have large thighs, and short legs. The ugliest of all are the Calmucks, in whose appearance there seems to be something frightful. They all lead an erratic life, remaining under tents of hair, or skins. They live upon horse flesh and that of camels, either raw or a little sodden between the horse and the saddle. They eat also flesh dried in the sun. Their most usual drink is mare's milk, fermented with millet ground into meal. They all have the head shaven, except a lock of hair on the top, which they let grow sufficiently long to form into tresses on each side of the face. The women, who are as ugly as the men, wear their hair, which they bind up with bits of copper and other ornaments of a like nature. The majority of these nations have no religion, no settled notions of morality, no decency of behaviour. They are chiefly robbers: and the natives of Dagestan, who live near their more polished neighbours, make a traffic of Tartar slaves who have been stolen, and sell them to the Turks and the Persians. Their chief riches consist in horses, of which perhaps there are more in Tartary than in any other part of the world. The natives are taught by custom to live in the same place with their horses: they are continually employed in managing them, and at last bring them to such great obedience that the horse seems actually to understand the rider's intention.

To this race of men also, we must refer the Chinese and the Japanese, however different they seem in their manners and ceremonies. It is the form of the body that we are now principally considering; and there is between these countries a surprising resemblance. It is in general allowed that the Chinese have broad faces, small eyes, flat noses, and scarce any beard; that they are broad and square shouldered, and rather less in stature than Europeans. These are marks common to them and the Tartars, and they may therefore be considered as being derived from the same original. "I have observed," says Chardin, "that in all the people from the east and the north of the Caspian sea, to the peninsula of Malacca, that the lines of the face, and the formation of the visage is the same. This has induced me to believe that all these nations are derived from the same original, however different either their complexions or their manners may appear: for as to the complexion, that proceeds entirely from the climate and the food; and as to the manners, these are generally the result of their different degrees of wealth or power." That they come from one stock, is evident also from this, that the Tartars who settle in China, quickly resemble the Chinese; and, on the contrary, the Chinese who settle in Tartary, soon assume the figure and the manners of the Tartars.

The Japanese so much resemble the Chinese, that one cannot hesitate to rank them in the same class. They only differ in being rather browner, as they inhabit a more southern climate. They are, in general, described as of a brown complexion, a short stature, a broad flat face, a very little beard, and black hair. Their customs and ceremonies are nearly the same; their ideas of beauty similar; and their artificial deformities of blackening the teeth, and bandaging the feet, entirely alike in both countries. They both, therefore, proceed from the same stock; and although they differ very much from their brutal progenitors, yet they owe their civilization wholly to the mildness of the climate in which they reside, and to the peculiar fertility of the soil. To this tribe also, we may refer the Cochin Chinese, the Siamese, the Tonquinese, and the inhabitants of Arracan, Laos, and Pegu, who, though all differing from the Chinese, and each other, nevertheless, have too strong a resemblance, not to betray their common original.

Another, which makes the third variety in the human species, is that of the southern Asiatics; the form of whose features and per sons may be easily distinguished from those of the Tartar races. The nations that inhabit the peninsula of India, seem to be the principal stock from whence the inhabitants of the islands that lie scattered in the Indian ocean have been peopled. They are, in general, of a slender shape, with long straight black hair, and often with Roman noses. Thus they resemble the Europeans in stature and features; but greatly differ in colour and habit of body. The Indians are of an olive colour, and in the more southern parts, quite black; although the word Mogul, in their language, signifies a white man. The women are extremely delicate, and bathe very often: they are of an olive colour, as well as the men: their legs and thighs are long, and their bodies short, which is the opposite to what is seen among the women of Europe. They are, as I am assured, by no means so fruitful as the European women; but they feel the pains of child-birth with much less sensibility, and are generally up and well the day following. In fact, these pains seem greatest in all countries where the women are most delicate, or the constitution enfeebled by luxury or indolence. The women of savage nations seem, in a great measure, exempt from painful labours; and even the hard-working wives of the peasants among ourselves, have this advantage from a life of industry, that their child-bearing is less painful. Over all India, the children arrive sooner at maturity, than with us of Europe. They often marry, and consummate, the husband at ten years old, and the wife at eight; and they frequently have children at that age. However, the women who are mothers so soon, cease bearing before they are arrived at thirty; and at that time, they appear wrinkled, and seem marked with all the deformities of age. The Indians have long been remarkable for their cowardice and effeminacy; every conqueror, that has attempted the invasion of their country, having succeeded. The warmth of the climate entirely influences their manners; they are slothful, submissive, and luxurious; satisfied with sensual happiness alone, they find no pleasure in thinking; and contented with slavery, they are ready to obey any master. Many tribes among them eat nothing that has life; they are fearful of killing the meanest insect; and have even erected hospitals for the maintenance of all kinds of vermin. The Asiatic dress is a loose flowing garment, rather fitted for the purposes of peace and indolence, than of industry or war. The vigour of the Asiatics is in general conformable to their dress and nourishment; fed upon rice, and clothed in effeminate silk vestments, their soldiers are unable to oppose the onset of an European army, and from the times of Alexander to the present day, we have scarce any instances of their success in arms. Upon the whole, therefore, they may be considered as a feeble race of sensualists, too dull to find rapture in any pleasures, and too indolent to turn their gravity into wisdom. To this class we may refer the Persians and the Arabians, and in general the inhabitants of the islands that lie scattered in the Indian ocean.

The fourth striking variety in the human species, is to be found among the negroes of Africa. This gloomy race of mankind is found to blacken all the southern parts of Africa, from eighteen degrees north of the line, to its extreme termination at the Cape of Good Hope I know it is said, that the Caffres, who inhabit the southern extremity of that large continent, are not to be ranked among the negro race: however, the difference between them, in point of colour and features, is so small, that they may very easily be grouped in this general picture; and in the one or two that I have seen, I could not perceive the smallest difference. Each of the negro nations, it must be owned, differ from each other; they have their peculiar countries, for beauty, like us; and different nations, as in Europe, pride themselves upon the regularity of their features.—Those of Guinea, for instance, are extremely ugly, and have an insupportable scent; those of Mosambique are reckoned beautiful, and have no ill smell whatsoever. The negroes, in general, are of a black colour, with a smooth soft skin. This smoothness proceeds from the downy softness of the hair which grows upon it; the strength of which gives a roughness to the feel, in those of a white complexion. Their skins, therefore, have a velvet smoothness, and seem less braced upon the muscles than ours. The hair of their heads differs entirely from what we are accustomed to, being soft, woolly, and short. The beard also partakes of the same qualities; but in this it differs, that it soon turns gray, which the hair is seldom found to do; so that several are seen with white beards, and black hair, at the same time. Their eyes are generally of a deep hazel; their noses flat and short; their lips thick and tumid; and their teeth of an ivory whiteness. This their only beauty, however, is set off by the colour of their skin; the contrast between the black and white being the more observable. It is false to say that their features are deformed by art; since, in the negro children born in European countries, the same deformities are seen to prevail; the same flatness in the nose; and the same prominence in the lips. They are, in general, said to be well shaped; but of such as I have seen, I never found one that might be justly called so; their legs being mostly ill formed, and commonly bending outward on the shin-bone. But it is not only in those parts of their bodies that are obvious, that they are disproportioned; those parts which among us are usually concealed by dress, with them are large and languid.* The women's breasts, after bearing one child, hang down below the navel; and it is customary with them to suckle the child at their backs, by throwing the breast over the shoulder. As their persons are thus naturally deformed, at least to our imaginations, their minds are equally incapable of strong exertions. The climate seems to relax their mental powers still more than those of the body; they are, therefore, in general, found to be stupid, indolent, and mischievous. The Arabians themselves, many colonies of whom have migrated southward into the most inland parts of Africa, seem to have degenerated from their ancestors; forgetting their ancient learning, and losing their beauty, they have become a race scarcely any way distinguishable from the original natives. Nor does it seem to have fared otherwise with the Portuguese, who, about two centuries ago, settled along this coast. They also are become almost as black as the negroes, and are said by some to be even more barbarous.

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* Linnæus, in prima linea sua, fœminas Africanas depingit sicut aliquid deforme in parte genitali gestantes, quod sinum pudoris nuncupat. Attamen nihil differunt a nostratibus in hac parte nisi quod labia pudendæ sint aliquantulum tumidiora. In hominibus etiam penis est longior et multo laxior.

The inhabitants of America make a fifth race, as different from all the rest in colour, as they are distinct in habitation. The natives of America (except in the northern extremity, where they resemble the Laplanders) are of a red or copper colour; and although, in the old world, different climates produce a variety of complexions and customs, the natives of the new continent seem to resemble each other in almost every respect. They are all nearly of one colour; all have black thick straight hair, and thin black beards; which, however, they take care to pluck out by the roots. They have, in general, flat noses, with high cheek-bones, and small eyes, and these deformities of nature they endeavour to increase by art: they flatten the nose, and often the whole head of their children, while the bones are yet susceptible of every impression. They paint the body and face of various colours, and consider the hair upon any part of it, except the head, as a deformity, which they are careful to eradicate. Their limbs are generally slighter made than those of the Europeans; and I am assured, they are far from being so strong. All these savages seem to be cowardly; they seldom are known to face their enemies in the field, but fall upon them at an advantage; and the greatness of their fears serves to increase the rigours of their cruelty. The wants which they often sustain, make them surprisingly patient in adversity: distress, by being grown familiar, becomes less terrible; so that their patience is less the result of fortitude than of custom. They have all a serious air, although they seldom think; and, however cruel to their enemies, are kind and just to each other. In short, the customs of savage nations in every country are almost the same; a wild, independent, and precarious life, produces a peculiar train of virtues and vices, and patience and hospitality, indolence and rapacity, content and sincerity, are found not less among the natives of America, than all the barbarous nations of the globe.

The sixth and last variety of the human species, is that of the Europeans, and the nations bordering on them. In this class we may reckon the Georgians, Circassians, and Mingrelians, the inhabitants of Asia Minor, and the northern parts of Africa, together with a part of those countries which lie north-west of the Caspian sea. The inhabitants of these countries differ a good deal from each other; but they generally agree in the colour of their bodies, the beauty of their complexions, the largeness of their limbs, and the vigour of their understandings. Those arts which might have had their invention among the other races of mankind, have come to perfection there. In barbarous countries, the inhabitants go either naked, or are awkwardly clothed in furs or feathers; in countries semi-barbarous, the robes are loose and flowing; but here the clothing is less made for show than expedition, and unites, as much as possible, the extremes of ornament and despatch.

To one or other of these classes we may refer the people of every country: and as each nation has been less visited by strangers, or has had less commerce with the rest of mankind, we find their persons and their manners more strongly impressed with one or other of the characters mentioned above. On the contrary, in those places where trade has long flourished, or where enemies have made many incursions, the races are usually found blended, and properly fall beneath no one character. Thus, in the islands of the Indian ocean, where a trade has been carried on for time immemorial, the inhabitants appear to be a mixture of all the nations upon the earth; white, olive, brown, and black men, are all seen living together in the same city, and propagate a mixed breed, that can be referred to none of the classes into which naturalists have thought proper to divide mankind.

Of all the colours by which mankind is diversified, it is easy to perceive that ours is not only the most beautiful to the eye, but the most advantageous. The fair complexion seems, if I may so express it, as a transparent covering to the soul; all the variations of the passions, every expression of joy or sorrow, flows to the cheek, and, without language, marks the mind. In the slightest change of health also, the colour of the European face is the most exact index, and often teaches us to prevent those disorders that we do not as yet perceive: not but the African black, and the Asiatic olive complexions, admit of their alterations also; but these are neither so distinct, nor so visible as with us: and, in some countries, the colour of the visage is never found to change; but the face continues in the same settled shade in shame and in sickness, in anger and despair.

The colour, therefore, most natural to man, ought to be that which is most becoming; and it is found that in all regions, the children are born fair, or at least red, and that they grow more black or tawny, as they advance in age. It should seem, consequently, that man is naturally white, since the same causes that darken the complexion in infants, may have originally operated, in slower degrees, in blackening whole nations. We could, therefore readily account for the blackness of different nations, did we not see the Americans, who live under the line, as well as the natives of Negroland, of a red colour, and but a very small shade darker than the natives of the northern latitudes, in the same continent. For this reason some have sought for other causes of blackness than the climate; and have endeavoured to prove that the blacks are a race of people, bred from one man, who was marked with accidental blackness. This, however, is but mere ungrounded conjecture: and, although the Americans are not so dark as the negroes, yet we must still continue in the ancient opinion, that the deepness of the colour proceeds from the excessive heat of the climate. For, if we compare the heats of Africa with those of America, we shall find they bear no proportion to each other. In America, all that part of the continent which lies under the line, is cool and pleasant, either shaded by mountains, or refreshed by breezes from the sea. But in Africa, the wide tract of country that lies under the line is very extensive, and the soil sandy; the reflection of the sun, therefore, from so large a surface of earth, is almost intolerable; and it is not to be wondered at, that the inhabitants should bear, in their looks, the marks of the inhospitable climate. In America, the country is but thinly inhabited; and the more torrid tracts are generally left desert by the inhabitants; for which reason they are not so deeply tinged by the beams of the sun. But in Africa the whole face of the country is fully peopled, and the natives are obliged to endure their situation without a power of migration. It is there, consequently, that they are in a manner tied down to feel all the severity of the heat; and their complexions take the darkest hue they are capable of receiving. We need not, therefore, have recourse to any imaginary propagation, from persons accidentally black, since the climate is a cause obvious and sufficient to produce the effect.

In fact, if we examine the complexion of different countries, we shall find them darken in proportion to the heat of their climate, and the shades gradually to deepen as they approach the line. Some nations, indeed, may be found not so much tinged by the sun as others, although they lie nearer the line. But this ever proceeds from some accidental causes; either from the country lying higher, and consequently being colder; or from the natives bathing oftener, and leading a more civilized life. In general, it may be asserted, that as we approach the line, we find the inhabitants of each country grow browner, until the colour deepens into perfect blackness. Thus, taking our standard from the whitest race of people, and beginning with our own country, which I believe bids fairest for the pre-eminence, we shall find the French, who are more southern, a slight shade deeper than we; going farther down, the Spaniards are browner than the French; the inhabitants of Fez darker than they; and the natives of Negroland the darkest of all. In what manner the sun produces this effect, and how the same luminary which whitens wax and linen, should darken the human complexion, is not easy to conceive. Sir Thomas Brown first supposed that a mucous substance, which had something of a vitriolic quality, settled under the reticular membrane, and grew darker with heat. Others have supposed that the blackness lay in the epidermis, or scarf-skin, which was burnt up like leather. But nothing has been satisfactorily discovered upon the subject; it is sufficient that we are assured of the fact; and that we have no doubt of the sun's tinging the complexion in proportion to its vicinity.

But we are not to suppose that the sun is the only cause of darkening the skin; the wind, extreme cold, hard labour, or coarse and sparing nourishment, are all found to contribute to this effect. We find the peasants of every country, who are most exposed to the weather, a shade darker than the higher ranks of people. The savage inhabitants of all places are exposed still more, and therefore contract a still deeper hue, and this will account for the tawny colour of the North American Indians. Although they live in a climate the same, or even more northerly than ours, yet they are found to be of complexions very different from those of Europe. But it must be considered that they live continually exposed to the sun; that they use many methods to darken their skins by art, painting them with red ochre, and anointing them with the fat of bears. Had they taken, for a succession of several generations, the same precautions to brighten their colour that an European does, it is very probable that they would in time come to have similar complexions, and perhaps dispute the prize of beauty.

The extremity of cold is not less productive of a tawny complexion than that of heat. The natives of the arctic circle, as was observed, are all brown; and those that lie most to the north are almost entirely black. In this manner both extremes are unfavourable to the human form and colour, and the same effects are produced under the poles that are found at the line.

With regard to the stature of different countries, that seems chiefly to result from the nature of the food, and the quantity of the supply. Not but that the severity of heat or cold may in some measure diminish the growth, and produce a dwarfishness of make. But in general the food is the great agent in producing this effect; where that is supplied in large quantities, and where its quality is wholesome and nutrimental, the inhabitants are generally seen above the ordinary stature. On the contrary, where it is afforded in a sparing quantity, or very coarse, and void of nourishment in its kind, the inhabitants degenerate, and sink below the ordinary size of mankind. In this respect they resemble other animals, whose bodies, by proper feeding, may be greatly augmented. An ox, on the fertile plains of India, grows to a size four times as large as the diminutive animal of the same kind bred in the Alps. The horses bred in the plains are larger than those of the mountain. So it is with man: the inhabitants of the valley are usually found taller than those of the hill: the natives of the Highlands of Scotland, for instance, are short, broad, and hardy; those of the Lowlands are tall and shapely. The inhabitants of Greenland, who live upon dried fish and seals, are less than those of Gambia or Senegal, where nature supplies them with vegetable and animal abundance.

The form of the face seems rather to be the result of custom. Nations who have long considered some artificial deformity as beautiful, who have industriously lessened the feet, or flattened the nose, by degrees begin to receive the impression they are taught to assume; and nature, in a course of ages, shapes itself to the constraint, and assumes hereditary deformity. We find nothing more common in births, than for children to inherit sometimes even the accidental deformities of their parents. We have many instances of squinting in the father, which he received from fright, or habit, communicated to the offspring; and I myself have seen a child distinctly marked with a scar, similar to one the father had received in battle. In this manner, accidental deformities may become natural ones; and by assiduity may be continued, and even increased, through successive generations. From this, therefore, may have arisen the small eyes and long ears of the Tartar and Chinese nations. From hence originally may have come the flat noses of the blacks, and the flat heads of the American Indians.

In this slight survey, therefore, I think we may see that all the variations in the human figure, as far as they differ from our own, are produced either by the rigour of the climate, the bad quality, or the scantiness of the provisions, or by the savage customs of the country. They are actual marks of the degeneracy in the human form; and we may consider the European figure and colour as standards to which to refer all other varieties, and with which to compare them. In proportion as the Tartar or American approaches nearer to European beauty, we consider the race as less degenerated; in proportion as he differs more widely, he has made greater deviations from his original form.

That we have all sprung from one common parent, we are taught, both by reason and religion, to believe; and we have good reason also to think that the Europeans resemble him more than any of the rest of his children. However, it must not be concealed that the olive-coloured Asiatic, and even the jet-black negro, claim this honour of hereditary resemblance; and assert, that white men are mere deviations from original perfection. Odd as this opinion may seem, they have Linnæus, the celebrated naturalist, on their side, who supposes man a native of the tropical climates, and only a sojourner more to the north. But, not to enter into a controversy upon a matter of a very remote speculation, I think one argument alone will suffice to prove the contrary, and show that the white man is the original source from whence the other varieties have sprung. We have frequently seen white children produced from black parents, but have never seen a black offspring the production of two whites. From hence we may conclude, that whiteness is the colour to which mankind naturally tends: for, as in the tulip, the parent stock is known by all the artificial varieties breaking into it; so in man, that colour must be original which never alters, and to which all the rest are accidentally seen to change. I have seen in London, at different times, two white negroes, the issue of black parents, that served to convince me of the truth of this theory. I had before been taught to believe that the whiteness of the negro's skin was a disease, a kind of milky whiteness, that might be called rather a leprous crust than a natural complexion. I was taught to suppose, that the numberless white negroes, found in various parts of Africa, the white men that go by the name of Chacrelas, in the East-Indies, and the white Americans, near the Isthmus of Darien, in the West-Indies, were all as so many diseased persons, and even more deformed than the blackest of the natives. But, upon examining that negro which was last shown in London, I found the colour to be exactly like that of an European; the visage white and ruddy, and the lips of the proper redness. However, there were sufficient marks to convince me of its descent. The hair was white and woolly, and very unlike any thing I had seen before. The iris of the eye was yellow, inclining to red; the nose was flat, exactly resembling that of a negro; and the lips thick and prominent. No doubt, therefore, remained of the child's having been born of negro parents: and the person who showed it had attestations to convince the most incredulous. From this, then, we see that the variations of the negro colour is into whiteness, whereas the white are never found to have a race of negro children. Upon the whole, therefore, all those changes which the African, the Asiatic, or the American, undergo, are but accidental deformities, which a kinder climate, better nourishment, or more civilized manners, would, in a course of centuries, very probably remove.

CHAPTER XII.

OF MONSTERS.

Hitherto I have only spoken of those varieties in the human species, that are common to whole nations; but there are varieties of another kind, which are only found in the individual; and being more rarely seen, are therefore called *monstrous*. If we examine into the varieties of distorted nature, there is scarcely a limb of the body, or a feature in the face, that has not suffered some reprobation, either from art or nature; being enlarged or diminished, lengthened or wrested from its due proportion. Linnæus, after having given a catalogue of monsters, particularly adds, the flat heads of Canada, the long heads of the Chinese, and the slender waists of the women of Europe, who by straight lacing take such pains to destroy their health, through a mistaken desire to improve their beauty.* It belongs more to the physician than the naturalist to attend to these minute deformities; and indeed it is a melancholy contemplation to speculate upon a catalogue of calamities, inflicted by unpitying nature, or brought upon us by our own caprice. Some, however, are fond of such accounts; and there have been books filled with nothing else. To these, therefore, I refer the reader, who may be better pleased with accounts of men with two heads, or without any head; of children joined in the middle; of bones turned into flesh, or flesh converted into bones, than I am.† It is sufficient here to observe, that every day's experience must have shown us miserable instances of this kind produced by nature or affection: calamities that no pity can soften, or assiduity relieve.

Passing over, therefore, every other account, I shall only mention the famous instance, quoted by Father Malbranche, upon which he founds his beautiful theory of monstrous productions. A woman of Paris, the wife of a tradesman, went to see a criminal broke alive upon the wheel, at the place of public execution. She was at that time two months advanced in her pregnancy, and no way subject to any disorders to affect the child in her womb. She was, however, of a tender habit of body; and, though led by curiosity to this horrid spectacle, very easily moved to pity and compassion. She felt, therefore, all those strong emotions which so terrible a sight must naturally inspire; shuddered at every blow the criminal received, and almost swooned at his cries. Upon returning from this scene of blood, she continued for some days pensive, and her imagination still wrought upon the spectacle she had lately seen. After some time, however, she seemed perfectly recovered from her fright, and had almost forgotten her former uneasiness. When the time of her delivery approached, she seemed no ways mindful of her former terrors, nor were her pains in labour more than usual in such circumstances. But what was the amazement of her friends and assistants when the child came into the world! It was found that every limb in its body was broken like those of the malefactor, and just in the same place. This poor infant had suffered the pains of life, even before its coming into the world: it did not die, but lived in a hospital in Paris for twenty years after, a wretched instance of the supposed powers of imagination in the mother, of altering and distorting the infant in the womb. The manner in which Malbranche reasons upon this fact, is as follows:—the Creator has established such a sympathy between the several parts of nature, that we are led not only to imitate each other, but also to partake in the same affections and desires. The animal spirits are thus carried to the respective parts of the body, to perform the same actions which we see others perform, to receive in some measure their wounds, and take part in their sufferings. Experience tells us, that if we look attentively on any person, severely beaten, or sorely wounded, the spirits immediately flow into those parts of the body, which correspond to those we see in pain. The more delicate the constitution, the more it is thus affected; the spirits making a stronger impression on the fibres of a weakly habit than of a robust one. Strong vigorous men see an execution without much concern, while women of nicer texture are struck with horror and concern. This sensibility in them must, of consequence, be communicated to all parts of their body; and, as the fibres of the child in the womb are incomparably finer than those of the mother, the course of the animal spirits must consequently produce greater alterations. Hence, every stroke given to the criminal, forcibly struck the imagination of the woman; and, by a kind of counter-stroke, the delicate tender frame of the child.

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* Linnæi Syst. vol. i. p. 29. Monorchides ut minus fertiles.

† Vide Phil. Trans. passim. Miscellan. Curioss. Johan. Baptist. Wenck. Dissertatio Physica an ex virilis humani seminis cum brutali per nefarium coitum commixtione aut vicissim ex bruti maris cum muliebri humano seminis commixtione possit verus homo generari. Vide etiam, Johnstoni Thaumatographia Naturalis. Vide Adalberti Disquisitio Physica ostenti duorum puerorum unus quorum dente aureo, alter cum capite giganteo Bilusæ spectabantur. A man without lungs and stomach, Journal de Scavans, 1682, p. 301; another without any brain. Andreas Caroli Memorabilia, p. 167 an. 1876; another without any head. Giornale di Roma, anno 1675, p. 26; another without any arms. New Memoirs of Literature, vol. iv. p. 446. In short, the variety of these accounts is almost infinite; and, perhaps, their use is as much circumscribed as their variety is extensive.

Such is the reasoning of an ingenious man upon a fact, the veracity of which many since have called in question.* They have allowed, indeed, that such a child might have been produced, but have denied the cause of its deformity. "How could the imagination of the mother," say they, "produce such dreadful effects upon her child? She has no communication with the infant; she scarcely touches it in any part; quite unaffected with her concerns, it sleeps in security, in a manner secluded by a fluid in which it swims, from her that bears it With what a variety of deformities," say they, "would all mankind be marked, if all the vain and capricious desires of the mother were thus readily written upon the body of the child?" Yet, notwithstanding this plausible way of reasoning, I cannot avoid giving some credit to the variety of instances I have either read or seen upon this subject If it be a prejudice, it is as old as the days of Aristotle, and to this day, as strongly believed by the generality of mankind as ever. It does not admit of a reason; and, indeed, I can give none, even why the child should, in any respect, resemble the father or the mother. The fact we generally find to be so. But why it should take the particular print of the father's features in the womb, is as hard to conceive, as why it should be affected by the mother's imagination. We all know what a strong effect the imagination has on those parts in particular, without being able to assign a cause how this effect is produced; and why the imagination may not produce the same effect in marking the child that it does in forming it, I see no reason. Those persons whose employment it is to rear up pigeons of different colours, can breed them, as their expression is, to a feather. In fact, by properly pairing them, they can give what colour they will to any feather in any part of the body. Were we to reason upon this fact, what could we say? Might it not be asserted, that the egg, being distinct from the body of the female, cannot be influenced by it? Might it not be plausibly said, that there is no similitude between any part of the egg and any particular feather, which we expect to propagate; and yet for all this, the fact is known to be true, and what no speculation can invalidate. In the same manner, a thousand various instances assure us, that the child in the womb is sometimes marked by the strong affections of the mother; how this is performed we know not; we only see the effect, without any connexion between it and the cause. The best physicians have allowed it, and have been satisfied to submit to the experience of a number of ages; but many disbelieve it because they expect a reason for every effect. This, however, is very hard to be given, while it is very easy to appear wise by pretending incredulity.

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* Buffon. vol. iv. p. 9

Among the number of monsters, dwarfs and giants are usually reckoned; though not, perhaps, with the strictest propriety, since they are no way different from the rest of mankind, except in stature. It is a dispute, however, about words, and therefore scarcely worth contending about. But there is a dispute, of a more curious nature, on this subject, namely, whether there are races of people thus very diminutive, or vastly large; or whether they be merely accidental varieties, that now and then are seen in the country, in a few persons, whose bodies some external cause has contributed to lessen or enlarge.

With regard to men of diminutive stature, all antiquity has been unanimous in asserting their national existence. Homer was the first who has given us an account of the pigmy nation contending with the cranes; and what poetical licence might be supposed to exaggerate, Athenæus has attempted seriously to confirm by historical assertion.* If we attend to these, we must believe, that in the internal parts of Africa there are whole nations of pigmy beings, not more than a foot in stature, who continually wage an unequal war with the birds and beasts that inhabit the plains in which they reside. Some of the ancients, however, and Strabo in particular, have supposed all these accounts to be fabulous, and have been more inclined to think this supposed nation of pigmies, nothing more than a species of apes, well known to be numerous in that part of the world. With this opinion the moderns have all concurred; and that diminutive race, which was described as human, has been long degraded into a class of animals that resemble us but very imperfectly.

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* Athenæus, ix. 390.

The existence, therefore, of a pigmy race of mankind, being founded in error, or in fable, we can expect to find men of diminutive stature only by accident, among men of the ordinary size. Of these accidental dwarfs, every country, and almost every village, can produce numerous instances. There was a time when these unfavoured children of nature were the peculiar favourites of the great; and no prince or nobleman thought himself completely attended, unless he had a dwarf among the number of his domestics. These poor little men were kept to be laughed at; or to raise the barbarous pleasure of their masters, by their contrasted inferiority. Even in England, as late as the times of King James I. the court was at one time furnished with a dwarf, a giant, and a jester: these the king often took a pleasure in opposing to each other, and often fomented quarrels among them, in order to be a concealed spectator of their animosity. It was a particular entertainment of the courtiers at that time, to see little Jeffery, for so the dwarf was called, ride round the lists, expecting his antagonist; and discovering in his actions, all the marks of contemptible resolution.

It was in the same spirit, that Peter of Russia, in the year 1710, celebrated a marriage of dwarfs. This monarch, though raised by his native genius far above a barbarian, was, nevertheless, still many degrees removed from actual refinement. His pleasures, therefore, were of the vulgar kind, and this was among the number. Upon a certain day, which he had ordered to be proclaimed several months before, he invited the whole body of his courtiers, and all the foreign ambassadors, to be present at the marriage of a pigmy man and woman. The preparations for this wedding were not only very grand, but executed in a style of barbarous ridicule. He ordered that all the dwarf men and women, within two hundred miles, should repair to the capital; and also insisted that they should be present at the ceremony. For this purpose he supplied them with proper vehicles; but so contrived it, that one horse was seen carrying in a dozen of them into the city at once, while the mob followed, shouting and laughing, from behind. Some of them were at first unwilling to obey an order which they knew was calculated to turn them into ridicule, and did not come; but he soon obliged them to obey; and, as a punishment, enjoined, that they should wait upon the rest at dinner. The whole company of dwarfs amounted to seventy, beside the bride and bridegroom, who were richly adorned, and in the extremity of the fashion. For this little company in miniature, every thing was suitably provided; a low table, small plates, little glasses, and in short, every thing was so fitted, as if all things had been dwindled to their own standard. It was his great pleasure to see their gravity and their pride; the contention of the women for places, and the men for superiority. This point he attempted to adjust, by ordering that the most diminutive should take the lead; but this bred disputes, for none would then consent to sit foremost. All this, however, being at last settled, dancing followed the dinner, and the ball was opened with a minuet by the bridegroom, who measured exactly three feet two inches high. In the end, matters were so contrived, that this little company, who met together in gloomy pride, and unwilling to be pleased, being at last familiarized to laughter, joined in the diversion, and became, as the journalist has it,* extremely sprightly and entertaining.

But whatever may be the entertainment such guests might afford when united, I never found a dwarf capable of affording any when alone. I have sometimes conversed with some of these that were exhibited at our fairs about town, and have ever found their intellects as contracted as their persons. They, in general, seemed to me to have faculties very much resembling those of children, and their desires likewise of the same kind; being diverted with the same sports, and best pleased with such companions. Of all those I have seen, which may amount to five or six, the little man, whose name was Coan, that died lately at Chelsea, was the most intelligent and sprightly. I have heard him and the giant, who sung at the theatres, sustain a very ridiculous duet, to which they were taught to give great spirit. But this mirth, and seeming sagacity, were but assumed. He had, by long habit, been taught to look cheerful upon the approach of company; and his conversation was but the mere etiquette of a person that had been used to receive visitors. When driven out of his walk, nothing could be more stupid or ignorant, nothing more dejected or forlorn. But we have a complete history of a dwarf, very accurately related by Mr. Daubenton, in his part of the Histoire Naturelle; which I will here take leave to translate.

This dwarf, whose name was Baby, was well known, having spent the greatest part of his life at Lunenville, in the palace of Stanislaus, the titular king of Poland. He was born near the village of Plaisne, in France, in the year 1741. His father and mother were peasants, both of good constitutions, and inured to a life of husbandry and labour. Baby, when born, weighed but a pound and a quarter. We are not informed of the dimensions of his body at that time; but we may conjecture they were very small, as he was presented on a plate to be baptized, and for a long time lay in a slipper. His mouth, although proportioned to the rest of his body, was not, at that time, large enough to take in the nipple; and he was, therefore, obliged to be suckled by a she-goat that was in the house; and that served as a nurse, attending to his cries with a kind of maternal fondness. He began to articulate some words when eighteen months old; and at two years he was able to walk alone. He was then fitted with shoes that were about an inch and a half long. He was attacked with several acute disorders; but the small-pox was the only one which left any marks behind it. Until he was six years old, he eat no other food but pulse, potatoes, and bacon. His father and mother were, from their poverty, incapable of affording him any better nourishment; and his education was little better than his food, being bred up among the rustics of the place. At six years old he was about fifteen inches high; and his whole body weighed but thirteen pounds. Notwithstanding this, he was well proportioned, and handsome; his health was good, but his understanding scarce passed the bounds of instinct. It was at that time that the king of Poland, having heard of such a curiosity, had him conveyed to Lunenville, gave him the name of *Baby*, and kept him in his palace.

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* Die dench wurdige. Iwerg. Hockweit, &c. Lipsiæ, 1713, vol. viii. page 102. seq

Baby, having thus quitted the hard condition of a peasant to enjoy all the comforts and conveniences of life, seemed to receive no alteration from his new way of living, either in mind or person. He preserved the goodness of his constitution till about the age of sixteen, but his body seemed to increase very slowly during the whole time; and his stupidity was such, that all instructions were lost in improving his understanding. He could never be brought to have any sense of religion, nor even to shew the least signs of a reasoning faculty They attempted to teach him dancing and music, but in vain; he never could make any thing of music; and as for dancing, although he beat time tolerably exact, yet he could never remember the figure, but while his dancing-master stood by to direct his motions. Notwithstanding, a mind thus destitute of understanding was not without its passions; anger and jealousy harassed it at times; nor was he without desires of another nature.

At the age of sixteen, Baby was twenty-nine inches tall; at this he rested; but having thus arrived at his acme, the alterations of puberty, or rather, perhaps, of old age, came fast upon him. From being very beautiful, the poor little creature now became quite deformed; his strength quite forsook him; his back-bone began to bend; his head hung forward; his legs grew weak; one of his shoulders turned awry; and his nose grew disproportionably large. With his strength, his natural spirits also forsook him; and, by the time he was twenty, he was grown feeble, decrepit, and marked with the strongest impressions of old age. It had been before remarked by some, that he would die of old age before he arrived at thirty; and, in fact, by the time he was twenty-two, he could scarcely walk a hundred paces, being worn with the multiplicity of his years, and bent under the burden of protracted life. In this year he died; a cold, attended with a slight fever, threw him into a kind of lethargy, which had a few momentary intervals; but he could scarce be brought to speak. However, it is asserted, that in the five last years of his life, he shewed a clearer understanding, than in his times of best health: but at length he died, after enduring great agonies, in the twenty-second year of his age.

Opposite to this accidental diminution of the human race, is that of its extraordinary magnitude. Concerning the reality of a nation of Giants, there have been many disputes among the learned. Some have affirmed the probability of such a race; and others, as warmly have denied the possibility of their existence. But it is not from any speculative reasonings, upon a subject of this kind, that information is to be obtained; it is not from the disputes of the scholar, but the labours of the enterprising, that we are to be instructed in this inquiry. Indeed, nothing can be more absurd, than what some learned men have advanced upon this subject. It is very unlikely, says

Grew, that there should either be dwarfs or giants; or if such, they cannot be fitted for the usual enjoyment of life and reason. Had man been born a dwarf, he could not have been a reasonable creature; for to that end, he must have a jolt head, and then he would not have body and blood enough to supply his brain with spirits; or if he had a small head, proportionable to his body, there would not be brain enough for conducting life. But it is still worse with giants; and there could never have been a nation of such, for there would not be food enough found in any country to sustain them; or, if there were beasts sufficient for this purpose, there would not be grass enough for their maintenance. But what is still more, add others, giants could never be able to support the weight of their own bodies; since a man of ten feet high, must be eight times as heavy as one of the ordinary stature; whereas he has but twice the size of muscles to support such a burden, and consequently would be overloaded with the weight of his own body. Such are the theories upon this subject, and they require no other answer, but that experience proves them both to be false; dwarfs are found capable of life and reason; and giants are seen to carry their own bodies. We have several accounts from mariners, that a nation of giants actually exists, and mere speculation should never induce us to doubt their veracity.

Ferdinand Magellan was the first who discovered this race of people along the coast, towards the extremity of South America. Magellan was a Portuguese, of noble extraction, who having long behaved with great bravery, under Albuquerque, the conqueror of India, he was treated with neglect by the court, upon his return. Applying therefore, to the king of Spain, he was intrusted with the command of five ships, to subdue the Molucca islands, upon one of which he was slain. It was in his voyage thither that he happened to winter in St. Julian's Bay, an American harbour, forty-nine degrees south of the line. In this desolate region, where nothing was seen but objects of terror, where neither trees nor verdure drest the face of the country, they remained for some months without seeing any human creature. They had judged the country to be utterly uninhabitable, when one day they saw approaching, as if he had been dropped from the clouds, a man of enormous stature, dancing and singing, and putting dust upon his head, as they supposed in token of peace. This overture for friendship was, by Magellan's command, quickly answered by the rest of his men; and the giant approaching, testified every mark of astonishment and surprise. He was so tall, that the Spaniards only reached his waist; his face was broad, his colour brown, and painted over with a variety of tints; each cheek had the resemblance of a heart drawn upon it; his hair was approaching to whiteness; he was clothed in skins, and armed with a bow. Being treated with kindness, and dismissed with some trifling presents, he soon returned with many more of the same stature; two of whom the mariners decoyed on ship board: nothing could be more gentle than they were in the beginning; they considered the fetters that were preparing for them as ornaments, and played with them like children with their toys; but when they found for what purpose they were intended, they instantly exerted their amazing strength, and broke them in pieces with a very easy effort. This account, with a variety of other circumstances, has been confirmed by succeeding travellers: Herrara, Sebald Wert, Oliver Van Noort, and James le Maire, all correspond in affirming the fact, although they differ in many particulars of their respective descriptions. The last voyager we have had, that has seen this enormous race, is Commodore Byron. I have talked with the person who first gave the relation of that voyage, and who was the carpenter of the Commodore's ship; he was a sensible, understanding man, and I believe extremely faithful. By him, therefore, I was assured, in the most solemn manner, of the truth of his relation; and this account has since been confirmed by one or two publications; in all which the particulars are pretty nearly the same. One of the circumstances which most puzzled me to reconcile to probability, was that of the horses, on which they are described as riding down to the shore. We know the American horse to be of European breed; and, in some measure, to be degenerated from the original. I was at a loss, therefore, to account how a horse of not more than fourteen hands high, was capable of carrying a man of nine feet; or, in other words, an animal almost as large as itself. But the wonder will cease, when we consider, that so small a beast as an ass, will carry a man of ordinary size tolerably well; and the proportion between this and the former instance is nearly exact. We can no longer, therefore, refuse our assent to the existence of this gigantic race of mankind; in what manner they are propagated, or under what regulations they live, is a subject that remains for future investigation. It should appear, however, that they are a wandering nation, changing their abode with the course of the sun, and shifting their situation, for the convenience of food, climate, or pasture.*

This race of giants are described as possessed of great strength; and, no doubt they must be very different from those accidental giants that are to be seen in different parts of Europe. Stature, with these, seems rather their infirmity than their pride; and adds to their burden, without increasing their strength. Of those I have seen, the generality were ill-formed and unhealthful; weak in their persons, or incapable of exerting what strength they were possessed of. The same defects of understanding that attended those of suppressed stature, were found in those who were thus overgrown: they were heavy, phlegmatic, stupid, and inclined to sadness. Their numbers, however, are but few; and it is thus kindly ordered by Providence, that as the middle is the state best fitted for happiness, so the middle ranks of mankind are produced in the greatest variety.

However, mankind seems naturally to have a respect for men of extraordinary stature; and it has been a supposition of long standing, that our ancestors were much taller, as well as much more beautiful, than we. This has been, indeed, a theme of poetical declamation from the beginning; and man was scarce formed, when he began to deplore an imaginary decay. Nothing is more natural than this progress of the mind, in looking up to antiquity with reverential wonder Having been accustomed to compare the wisdom of our fathers with our own, in early imbecility, the impression of their superiority remains when they no longer exist, and when we cease to be inferior. Thus the men of every age consider the past as wiser than the present; and the reverence seems to accumulate as our imaginations ascend. For this reason, we allow remote antiquity many advantages, without disputing their title: the inhabitants of uncivilized countries represent them as taller and stronger; and the people of a more polished nation, as more healthy and more wise. Nevertheless, these attributes seem to be only the prejudices of ingenuous minds; a kind of gratitude, which we hope in turn to receive from posterity. The ordinary stature of men, Mr. Derham observes, is, in all probability, the same now as at the beginning. The oldest measure we have of the human figure, is in the monument of Cheops, in the first pyramid of Egypt. This must have subsisted many hundred years before the times of Homer, who is the first that deplores the decay. This monument, however, scarce exceeds the measure of our ordinary coffins: the cavity is no more than six feet long, two feet wide, and deep in about the same proportion. Several mummies also, of a very early age, are found to be only of the ordinary stature; and shew that, for these three thousand years at least, men have not suffered the least diminution. We have many corroborating proofs of this, in the ancient pieces of armour which are dug up in different parts of Europe. The brass helmet dug up at Medauro, fits one of our men, and yet is allowed to have been left there at the overthrow of Asdrubal. Some of our finest antique statues, which we learn from Pliny and others to be exactly as big as life, still continue to this day, remaining monuments of the superior excellence of their workmen indeed, but not of the superiority of their stature. We may conclude, therefore, that men have been, in all ages, pretty much of the same size they are at present; and that the only difference must have been accidental, or perhaps national.

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* Later voyagers have not confirmed this account, in some particulars.

As to the superior beauty of our ancestors, it is not easy to make the comparison; beauty seems a very uncertain charm; and frequently is less in the object, than in the eye of the beholder. Were a modern lady's face formed exactly like the Venus of Medicis, or the Sleeping Vestal, she would scarce be considered beautiful, except by the lovers of antiquity, whom, of all her admirers, perhaps, she would be least desirous of pleasing. It is true, that we have some disorders among us that disfigure the features, and from which the ancients were exempt; but it is equally true, that we want some which were common among them, and which were equally deforming. As for their intellectual powers, these also were probably the same as ours: we excel them in the sciences, which may be considered as a history of accumulated experience; and they excel us in the poetic arts, as they had the first rifling of all the striking images of nature.

CHAPTER XIII.

OF MUMMIES, WAX-WORKS, &C

"MAN* is not content with the usual term of life, but he is willing to lengthen out his existence by art; and although he cannot prevent death, he tries to obviate his dissolution It is natural to attempt to preserve even the most trifling relics of what has long given us pleasure; nor does the mind separate from the body, without a wish, that even the wretched heap of dust it leaves behind, may yet be remembered. The embalming, practised in various nations, probably had its rise in this fond desire: an urn filled with ashes, among the Romans, served as a pledge of continuing affection; and even the grassy graves in our own church-yards, are raised above the surface, with the desire that the body below should not be wholly forgotten. The soul, ardent after eternity for itself, is willing to procure, even for the body, a prolonged duration."

But of all nations, the Egyptians carried this art to the highest perfection: as it was a principle of their religion, to suppose the soul continued only coeval to the duration of the body, they tried every art to extend the life of the one, by preventing the dissolution of the other. In this practice they were exercised from the earliest ages; and the mummies they have embalmed in this manner continue in great numbers to the present day. We are told, in Genesis, that Joseph seeing his father expire, gave orders to his physicians to embalm the body, which they executed in the compass of forty days, the usual time of embalming. Herodotus also, the most ancient of the profane historians, gives us a copious detail of this art, as it was practised, in his time, among the Egyptians. There are certain men among them, says he, who practise embalming as a trade; which they perform with all expedition possible. In the first place, they draw out the brain through the nostrils, with irons adapted to this purpose; and in proportion as they evacuate it in this manner, they fill up the cavity with aromatics: they next cut open the belly, near the sides, with a sharpened stone, and take out the entrails, which they cleanse, and wash in palm oil; having performed this operation, they roll them in aromatic powder, fill them with myrrh, cassia, and other perfumes, except incense, and replace them, sewing up the body again. After these precautions, they salt the body with nitre, and keep it in the salting-place for seventy days, it not being permitted to preserve it so any longer. When the seventy days are accomplished, and the body washed once more, they swathe it in bands made of linen, which have been dipt in a gum the Egyptians use instead of salt. When the friends have taken back the body, they make a hollow trough, something like the shape of a man, in which they place the body; and this they inclose in a box, preserving the whole as a most precious relic, placed against the wall. Such are the ceremonies used with regard to the rich; as for those who are contented with a humbler preparation, they treat them as follows: they fill a syringe with an odoriferous liquor extracted from the cedar-tree, and, without making an incision, inject it up the body of the deceased, and then keep it in nitre, as long as in the former case. When the time is expired, they evacuate the body of the cedar liquor which had been injected; and such is the effect of this operation, that the liquor dissolves the intestines, and brings them away: the nitre also serves to eat away the flesh, and leaves only the skin and the bones remaining. This done, the body is returned to the friends, and the embalmer takes no farther trouble about it. The third method of embalming those of the meanest condition, is merely by purging and cleansing the intestines by frequent injections, and preserving the body for a similar term in nitre, at the end of which it is restored to the relations.

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* This chapter I have, in a great measure, translated from Mr. Daubenton. Whatever is added from others, is marked with inverted commas.

Diodorus Siculus also makes mention of the manner in which these embalmings are performed. According to him, there were several officers appointed for this purpose: the first of them, who was called the scribe, marked those parts of the body, on the left side, which were to be opened; the cutter made the incision; and one of those that were to salt it, drew out all the bowels, except the heart and the kidneys; another washed them in palm wine and odoriferous liquors; afterwards they anointed for above thirty days with cedar, gum, myrrh, cinnamon, and other perfumes. These aromatics preserved the body entire for a long time, and gave it a very agreeable odour. It was not in the least disfigured by this preparation; after which it was returned to the relations, who kept it in a coffin, placed upright against a wall.

Most of the modern writers who have treated on this subject, have merely repeated what has been said by Herodotus; and if they add any thing of their own, it is but merely from conjecture. Dumont observes, that it is very probable, that aloes, bitumen, and cinnamon, make a principal part of the composition which is used on this occasion: he adds, that, after embalming, the body is put into a coffin, made of the sycamore-tree, which is almost incorruptible. Mr. Grew remarks, that in an Egyptian mummy, in the possession of the Royal Society, the preparation was so penetrating, as to enter into the very substance of the bones, and rendered them so black that they seemed to have been burnt. From this he is induced to believe that the Egyptians had a custom of embalming their dead, by boiling them in a kind of liquid preparation, until all the aqueous parts of the body were exhaled away; and until the oily or gummy matter had penetrated throughout. He proposes, in consequence of this, a method of macerating, and afterwards of boiling the dead body in oil of walnut.

I am, for my own part, of opinion that there were several ways of preserving dead bodies from putrefaction; and that this would be no difficult matter, since different nations have all succeeded in the attempt. We have an example of this kind among the Guanches, the ancient inhabitants of the island of Teneriff. Those who survived the general destruction of this people by the Spaniards, when they conquerors of this island, informed them that the art of embalming was still preserved there; and that there was a tribe of priests among them possessed of the secret, which they kept concealed as a sacred mystery. As the greatest part of the nation was destroyed, the Spaniards could not arrive at a complete knowledge of this art; they only found out a few of the particulars. Having taken out the bowels, they washed the body several times in a lee, made of the dried bark of the pine-tree, warmed during the summer by the sun, or by a stove in the winter. They afterwards anointed it with butter, or the fat of bears, which they had previously boiled with odoriferous herbs, such as sage and lavender. After this unction, they suffered the body to dry, and then repeated the operation as often as it was necessary, until the whole substance was impregnated with the preparation. When it was become very light, it was then a certain sign that it was fit and properly prepared. They then rolled it up in the dried skins of goats; which, when they had a mind to save expense, they suffered to remain with the hair still growing upon them. Purchas assures us, that he has seen mummies of this kind in London; and mentions the name of a gentleman who had seen several of them in the island of Teneriff, which were supposed to have been two thousand years old; but without any certain proofs of such great antiquity. This people, who probably came first from the coasts of Africa, might have learned this art from the Egyptians, as there was a traffic carried on from thence into the most internal parts of Africa.

Father Acosta and Garcilasso de la Vega make no doubt but that the Peruvians understood the art of preserving their dead for a very long space of time. They assert their having seen the bodies of several incas, that were perfectly preserved. They still preserved their hair and their eye-brows; but they had eyes made of gold, put in the places of those taken out. They were clothed in their usual habits, and seated in the manner of the Indians, their arms placed on their breasts. Garcilasso touched one of their fingers, and found it apparently as hard as wood; and the whole body was not heavy enough to overburden a weak man who should attempt to carry it away. Acosta presumes that these bodies were embalmed with bitumen, of which the Indians knew the properties. Garcilasso, however, is of a different opinion, as he saw nothing bituminous about them; but he confesses that he did not examine them very particularly, and he regrets his not having inquired into the methods used for that purpose. He adds, that being a Peruvian, his countrymen would not have scrupled to inform him of the secret, if they really had it still among them.

Garcilasso, thus being ignorant of the secret, makes use of some inductions to throw light upon the subject; he asserts that the air is so dry and so cold at Cusco, that flesh dries there like wood, without corrupting; and he is of opinion that they dried the body in snow, before they applied the bitumen: he adds, that in the times of the incas, they usually dried the flesh which was designed for the use of the army; and that when they had lost their humidity, they might be kept without salt, or any other preparation.

It is said, that at Spitsbergen, which lies within the arctic circle, and, consequently, in the coldest climate, bodies never corrupt, nor suffer any apparent alteration, even though buried for thirty years: nothing corrupts or putrefies in that climate; the wood which has been employed in building those houses where the train-oil is separated, appears as fresh as the day it was first cut.

If excessive cold, therefore, be thus capable of preserving bodies from corruption, it is not less certain that a great degree of dryness, produced by heat, produces the same effect. It is well known that the men and animals that are buried in the sands of Arabia, quickly dry up, and continue in preservation for several ages, as if they had been actually embalmed. It has often happened, that whole caravans have perished in crossing those deserts, either by the burning winds that infest them, or by the sands which are raised by the tempest, and overwhelm every creature in certain ruin. The bodies of those persons are preserved entire; and they are often found in this condition by some accidental passenger. Many authors, both ancient and modern, make mention of such mummies as these; and Shaw says that he has been assured that numbers of men, as well as other animals, have been thus preserved, for times immemorial, in the burning sands of Saibah, which is a place, he supposes, situate between Rasem and Egypt.

The corruption of dead bodies being entirely caused by the fermentation of the humours, whatever is capable of hindering or retarding this fermentation, will contribute to their preservation. Both heat and cold, though so contrary in themselves, produce similar effects in this particular, by drying up the humours. The cold in condensing and thickening them, and the heat in evaporating them before they have time to act upon the solids. But it is necessary that these extremes should be constant; for if they succeed each other so as that cold shall follow heat, or dryness humidity, it must then necessarily happen, that corruption must ensue. However, in temperate climates, there are natural causes capable of preserving dead bodies, among which we may reckon the quality of the earth in which they are buried. If the earth be drying and astringent, it will imbibe the humidity of the body; and it may probably be for this reason that the bodies buried in the monastery of the Cordeliers, at Thoulouse, do not putrefy, but dry in such a manner that they may be lifted up by one arm.

The gums, resins, and bitumens, with which dead bodies are embalmed, keep off the impressions which they would else receive from the alteration of the temperature of the air; and still more, if a body thus prepared be placed in a dry or burning sand, the most powerful means will be united for its preservation. We are not to be surprised, therefore, at what we are told by Chardin, of the country of Chorosan, in Persia. The bodies which have been previously embalmed, and buried in the sands of that country, as he assures us, are found to petrify; or, in other words, to become extremely hard, and are preserved for several ages. It is asserted that some of them have continued for a thousand years

The Egyptians, as has been mentioned above, swathed the body with linen bands, and inclosed it in a coffin; however, it is probable that with all these precautions, they would not have continued till now, if the tombs, or pits, in which they were placed, had not been dug in a dry, chalky soil, which was not susceptible of humidity; and which was, besides, covered over with a dry sand of several feet thickness.

The sepulchres of the ancient Egyptians subsist to this day. Most travellers who have been in Egypt have described those of ancient mummies, and have seen the mummies interred there. These catacombs are within two leagues of the ruins of this city, nine leagues from Grand Cairo, and about two miles from the village of Zaccara. They extend from thence to the Pyramids of Pharaoh, which are about eight miles distant. These sepulchres lie in a field, covered with a fine running sand, of a yellowish colour. The country is dry and hilly; the entrance of the tomb is choaked up with sand; there are many open, but several more that are still concealed. The inhabitants of the neighbouring village have no other commerce, or method of subsisting, but by seeking out mummies, and selling them to such strangers as happen to be at Grand Cairo. " This commerce, some years ago, was not only a very common, but a very gainful one. A complete mummy was often sold for twenty pounds: but it must not be supposed that it was bought at such a high price from a mere passion for antiquity; there were much more powerful motives for this traffic. Mummy, at that time, made a considerable article in medicine; and a thousand imaginary virtues were ascribed to it, for the cure of most disorders, particularly of the paralytic kind. There was no shop, therefore, without mummy in it; and no physician thought he had properly treated his patient, without adding this to his prescription. Induced by the general repute, in which this supposed drug was at that time, several Jews, both of Italy and France, found out the art of imitating mummy so exactly, that they, for a long time, deceived all Europe. This they did by drying dead bodies in ovens, after having prepared them with myrrh, aloes, and bitumen. Still, however, the request for mummies continued, and a variety of cures were daily ascribed to them. At length, Paræus wrote a treatise on their total inefficacy in physic; and showed their abuse in loading the stomach, to the exclusion of more efficacious medicines. From that time, therefore, their reputation began to decline; the Jews discontinued their counterfeits, and the trade returned entire to the Egyptians, when it was no longer of value. The industry of seeking after mummies is now totally relaxed, their price merely arbitrary, and just what the curious are willing to give.

In seeking for mummies, they first clear away the sand, which they may do for weeks together, without finding what is wanted. Upon coming to a little square opening of about eighteen feet in depth, they descended into it, by holes for the feet, placed at proper intervals, and there they are sure of finding what they seek for. These caves, or wells, as they call them, are hollowed out of a white freestone, which is found in all this country, a few feet below the covering of sand. When one gets to the bottom of these, which are sometimes fort- feet below the surface, there are several square openings, on each side, into passages of ten or fifteen feet wide, and these lead to chambers of fifteen or twenty feet square. There are all hewn out of the rock ; and in each of the catacombs are to be found several of these apartments, communicating with each other. They extend a great way under ground so as to be under the city of Memphis, and in a manner to undermine its environs.

In some of the chambers, the walls are adorned with figures and hieroglyphics ; in others, the mummies are found in tombs round the apartment hollowed out in the rock. These tombs are upright, and cut into the shape of a man, with his arms stretched out. There are others found, and these in the greatest number, in wooden coffins, or in cloths covered with bitumen. These coffins, or wrappers, are covered all over with a variety of ornaments. There are some of them painted, and adorned with figures, such as that of Death, and the leaden seals, on which several characters are engraven. Some of these coffins are carved into the human shape ; but the head alone is distinguishable ; the rest of the body is all of a piece, and terminated by a pedestal, while there are some with their arms hanging down ; and it is by these marks that the bodies of persons of rank are distinguished from those of the meaner order. These are generally found lying on the floor, without any profusion of ornaments ; and, in some chambers the mummies are found indiscriminately piled upon each other, and buried in the sand.

Many mummies are found lying on their backs ; their heads turned to the north, and their hands placed on the belly. The bands of linen, with which these were swathed, are found to be more than a thousand yards long ; and, of consequence, the number of circumvolutions they make about the body must have been amazing. These were performed by the beginning at the head, and ending at the feet ; but they contrived it so as to avoid covering the face. However, when the face is entirely uncovered, it moulders into dust immediately upon the admission of the air. When, therefore, it is preserved entire, a slight covering of cloth is so disposed over it, as that the shape of the eyes, the nose, and the mouth, are seen under it. Some mummies have been found with a long beard, and hair that reached down to the mid-leg, nails of a surprising length, and some gilt, or at least painted of a gold colour. Some are found with bands upon the breast, covered with hieroglyphics, in gold, silver, or in green : and some with tutelary idols, and other figures of jasper, within their body. A piece of gold, also, has often been found under their tongues, of about two pistoles value ; and, for this reason, the Arabians spoil all the mummies they meet with, in order to get at the gold.

But though art, or accident, has thus been found to preserve dead bodies entire, it must by no means be supposed that it is capable of preserving the exact form and lineaments of the deceased person. Those bodies which are found dried away in the deserts, or in some particular church-yards, are totally deformed, and scarce any lineaments remain of their external structure. Nor are the mummies preserved by embalming, in a better condition. The flesh is dried away, hardened, and hidden under a variety of bandages ; the bowels, as we have seen, are totally removed ; and from hence, in the most perfect of them, we see only a shapeless mass of skin discoloured and even the features scarce distinguishable. The art is, therefore, an effort rather of preserving the substance than the likeness of the deceased; and has, consequently, not been brought to its highest pitch of perfection. It appears from a mummy, not long since dug up in France, that the art of embalming was more completely understood in the western world than even in Egypt. This mummy, which was dug up at Auvergne, was an amazing instance of their skill, and is one of the most curious relics in the art of preservation. As some peasants, in that part of the world, were digging in a field near Rion, within about twenty-six paces of the highway, between that and the river Artier, they discovered a tomb, about a foot and a half beneath the surface. It was composed only of two stones; one of which formed the body of the sepulchre, and the other the cover. This tomb was of free-stone; seven feet and a half long, three feet and a half broad, and about three feet high. It was of rude workmanship; the cover had been polished, but was without figure or inscription: within this tomb was placed a leaden coffin, four feet seven inches long, fourteen inches broad, and fifteen high. It was not made coffin-fashion, but oblong, like a box, equally broad at both ends, and covered with a lid that fitted on like a snuff-box, without a hinge. This cover had two holes in it, each of about two inches long, and very narrow, filled with a substance resembling butter; but for what purpose intended remains unknown. Within this coffin was a mummy, in the highest and most perfect preservation. The internal sides of the coffin were filled with an aromatic substance, mingled with clay. Round the mummy was wrapped a coarse cloth, in form of a napkin; under this were two shirts, or shrouds, of the most exquisite texture; beneath these a bandage, which covered all parts of the body, like an infant in swaddling clothes; still under this general bandage there was another, which went particularly round the extremities, the hands, and the legs. The head was covered with two caps; the feet and hands were without any particular bandages; and the whole body was covered with an aromatic substance, an inch thick. When these were removed, and the body exposed naked to view, nothing could be more astonishing than the preservation of the whole, and the exact resemblance it bore to a body that had been dead a day or two before. It appeared well proportioned, except that the head was rather large, and the feet small. The skin had all the pliancy and colour of a body lately dead: the visage, however, was of a brownish hue. The belly yielded to the touch; all the joints were flexible, except those of the legs and feet; the fingers stretched forth of themselves when bent inwards. The nails still continued entire; and all the marks of the joints, both in the fingers, the palms of the hands, and the soles of the feet, remained perfectly visible. The bones of the arms and legs were soft and pliant; but, on the contrary, those of the skull preserved their rigidity; the hair, which only covered the back of the head, was of a chesnut colour, and about two inches long. The pericranium at top was separated from the skull by an incision, in order to open it for the introducing proper aromatics in the place of the brain, where they were found mixed with clay. The teeth, the tongue, and the ears, were all preserved in perfect form. The intestines were not taken out of the body, but remained pliant and entire, as in a fresh subject; and the breast was made to rise and fall like a pair of bellows. The embalming preparation had a very strong and pungent smell, which the body preserved for more than a month after it was exposed to the air. This odour was perceived wherever the mummy was laid, although it remained there but a very short time, it was even pretended that the peasants of the neighbouring villages were incommoded by it. If one touched either the mummy, or any part of the preparation, the hands smelled of it for several hours after, although washed with water, spirit of wine, or vinegar. This mummy, having remained exposed for some months to the curiosity of the public, began to suffer some mutilations. A part of the skin of the forehead was cut off, the teeth were drawn out, and some attempts were made to pull away the tongue. It was therefore, put into a glass case, and shortly after transmitted to the king of France's cabinet at Paris.

There are many reasons to believe this to be the body of a person of the highest distinction; however, no marks remain to assure us either of the quality of the person, or the time of his decease. There only are to be seen some irregular figures on the coffin, one of which represents a kind of star. There were also some singular characters upon the bandages, which were totally defaced by those who had torn them away. However, it should seem that it had remained for several ages in this state, since the first years immediately succeeding the interment, are usually those in which the body is most liable to decay. It appears also to be a much more perfect method of embalming than that of the Egyptians; as in this the flesh continues with its natural elasticity and colour, the bowels remain entire, and the joints have almost the pliancy which they had when the person was alive. Upon the whole, it is probable that a much less tedious preparation than that used by the Egyptians would have sufficed to keep the body from putrefaction; and that an injection of petreoleum inwardly, and a layer of asphaltum without, would have sufficed to have made a mummy; and it is remarkable that Auvergne, where this was found, affords these two substances in sufficient plenty. This art, therefore, might be brought to greater perfection than it has arrived at hitherto, were the art worth preserving. But mankind have long since grown wiser in this respect, and think it unnecessary to keep by them a deformed carcass, which, instead of aiding their magnificence, must only serve to mortify their pride.

CHAPTER XIV.

OF ANIMALS.

Leaving man, we now descend to the lower ranks of animated nature, and prepare to examine the life, manners, and characters of these our humble partners in the creation. But, in such a wonderful variety as is diffused around us, where shall we begin! The number of beings endued with life, as well as we, seems, at first view, infinite. Not only the forest, the waters, the air teems with animals of various kinds; but almost every vegetable, every leaf, has millions of minute inhabitants, each of which fill up the circle of its allotted life, and some of which are found objects of the greatest curiosity. In this seeming exuberance of animals, it is natural for ignorance to lie down in hopeless uncertainty, and to declare what requires labour to particularize to be utterly inscrutable. It is otherwise, however, with the active and searching mind; no way intimidated with the immense variety, it begins the task of numbering, grouping, and classing all the various kinds that fall within its notice; finds every day new relations between the several parts of the creation; acquires the art of considering several at a time under one point of view, and at last begins to find that the variety is neither so great nor so inscrutable as was at first imagined. As in a clear night, the number of the stars seems infinite; yet, if we sedulously attend to each in his place, and regularly class them, they will soon be found to diminish, and come within a scanty computation.

Method is one of the principal helps in natural history, and without it very little progress can be made in this science. It is by that alone we can hope to dissipate the glare, if I may so express it, which arises from a multiplicity of objects at once presenting themselves to the view. It is method that fixes the attention to one point, and leads it, by slow and certain degrees, to leave no part of nature unobserved.

All naturalists, therefore, have been very careful in adopting some method of classing or grouping the several parts of nature; and some have written books of natural history with no other view. These methodical divisions some have treated with contempt,* not considering that books, in general, are written with opposite views; some to be read, and some only to be occasionally consulted. The methodists in natural history, seem to be content with the latter advantage; and have sacrificed to order alone, all the delights of the subject, all the arts of heightening, awakening, or continuing curiosity. But they certainly have the same use in science that a dictionary has in language: but with this difference, that in a dictionary we proceed from the name to the definition; in a system of natural history, we proceed from the definition to find out the thing. Without the aid of system, nature must still have lain undistinguished, like furniture in a lumber-room: every thing we wish for is there, indeed; but we know not where to find it. If, for instance, in a morning excursion, I find a plant, or an insect, the name of which I desire to learn; or, perhaps, am curious to know whether already known; in this inquiry I can expect information only from one of these systems, which, being couched in a methodical form, quickly directs me to what I seek for. Thus we will suppose that our inquirer has met with a spider, and that he has never seen such an insect before. He is taught by the writer of a system† to examine whether it has wings, and he finds that it has none. He therefore is to look for it among the wingless insects, or the Aptera, as Linnæus calls them: he then is to see whether the head and breast make one part of the body, or are disunited; he finds they make one he is then to reckon the number of feet and eyes, and he finds that it has eight of each. The insect, therefore, must be either a scorpion or a spider; but he lastly examines its feelers, which he finds clavated, or clubbed; and, by all these marks, he at last discovers it to be a spider. Of spiders, there are forty-seven sorts; and, by reading the description of each, the inquirer will learn the name of that which he desires to know. With the name of the insect, he is also directed to those authors that have given any account of it, and the page where that account is to be found; by this means he may know at once what has been said of that animal by others, and what there is of novelty in the result of his own researches.

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* Mr. Buffon, in his Introduction, &c.

† Linnæus

From hence, it will appear how useful these systems in natural history are to the inquirer; but, having given them all their merit, it would be wrong not to observe, that they have, in general, been very much abused. Their authors, in general, seem to think that they are improvers of natural history, when in reality they are but guides; they seem to boast that they are adding to our knowledge, while they are only arranging it. These authors, also, seem to think that the reading of their works and systems, is the best method to attain a knowledge of nature; but, setting aside the impossibility of getting through whole volumes of a dry long catalogue, the multiplicity of whose contents is too great for even the strongest memory, such works rather tell us the names than the history of the creature we desire to inquire after. In these dreary pages, every insect, or plant, that has a name, makes as distinguished a figure as the most wonderful, or the most useful. The true end of studying nature is to make a just selection, to find those parts of it that most conduce to our pleasure or convenience, and to leave the rest in neglect. But these systems, employing the same degree of attention upon all, give us no opportunities of knowing which most deserves attention; and he who has made his knowledge from such systems only, has his memory crowded with a number of trifling, or minute particulars, which it should be his business and his labour to forget. These books, as was said before, are useful to be consulted, but they are very unnecessary to be read; no inquirer into nature should be without one of them; and, without any doubt, Linnæus deserves the preference.

One fault more, in almost all these systematic writers, and that which leads me to the subject of the present chapter, is, that seeing the necessity of methodical distribution in some parts of nature, they have introduced it into all. Finding the utility of arranging plants, birds, or insects, they have arranged quadrupeds also with the same assiduity; and although the number of these is so few as not to exceed two hundred,* they have darkened the subject with distinctions and divisions, which only serve to puzzle and perplex. All method is only useful in giving perspicuity, where the subject is either dark or copious: but with regard to quadrupeds, the number is but few; many of them we are well acquainted with by habit; and the rest may verv readily be known, without any method. In treating of such, therefore, it would be useless to confound the reader with a multiplicity of divisions; as quadrupeds are conspicuous enough to obtain the second rank in nature, it becomes us to be acquainted with, at least, the names of them all. However, as there are naturalists who have gained a name from the excellence of their methods in classing these animals, some readers may desire to have a knowledge of what has been laboriously invented for their instruction. I will just take leave, therefore, to mention the most applauded methods of classing animals, as adopted by Ray, Klein, and Linnæus; for it often happens, that the terms which have been long used in a science, though frivolous, become by prescription a part of the science itself.

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* In Dr. Shaw's General Zoology, the number of quadrupeds, not including the cetaceous and seal tribes, amount to five hundred and twelve, besides their varieties.

Ray, after Aristotle, divides all animals into two kinds; those which have blood, and those which are bloodless. In the last class, he places all the insect tribes. The former he divides into such as breathe through the lungs, and such as breathe through gills: these last comprehend the fishes. In those which breathe through the lungs, some have the heart composed of two ventricles, and some have it of one. Of the last are all animals of the cetaceous kind, all oviparous quadrupeds, and serpents. Of those that have two ventricles, some are oviparous, which are the birds; and some viviparous, which are quadrupeds. The quadrupeds he divides into such as have a hoof, such as are claw-footed. Those with the hoof, he divides all such such as have it undivided, such as have it cloven, and such as have the hoof divided into more parts, as the rhinoceros, and hippopotamos. Animals with the cloven hoof, he divides into such as chew the cud, such as the cow, and the sheep; and such as are not ruminant, as the hog. He divides those animals that chew the cud, into four kinds: the first have hollow horns, which they never shed, as the cow; the second is of a less species, and is of the sheep kind; the third is of the goat kind; and the last, which have solid horns, and shed them annually, are of the deer kind. Coming to the claw-footed animals, he finds some with large claws, resembling the fingers of the human hand; and these he makes the ape kind. Of the others, some have the foot divided into two, and have a claw to each division; these are the camel kind. The elephant makes a kind by itself, as its claws are covered over by a skin. The rest of the numerous tribe of claw-footed animals he divides into two kinds; the analogous, or such as resemble each other; and the anomalous, which differ from the rest. The analogous claw-footed animals, are of two kinds; they have more than two cutting teeth in each jaw, such as the lion and the dog, which are carnivorous; or they have but two cutting teeth in each jaw; and these are chiefly fed upon vegetables. The carnivorous kinds are divided into the great and little. The great carnivorous animals are divided into such as have a short snout, as the cat and the lion; and such as have it long and pointed, as the dog and the wolf. The little claw-footed carnivorous animals, differ from the great, in having a proportionably smaller head, and a slender body, that fits them for creeping into holes, in pursuit of their prey, like worms; and they are therefore called the vermin kind.

We see, from this sketch of division and sub-division, how a subject, extremely delightful and amusing in itself, may be darkened and rendered disgusting. But notwithstanding, Ray seems to be one of the most simple distributors; and his method is still, and not without reason, adopted by many. Such as have been at the trouble to learn this method, will certainly find it useful; nor would we be thought, in the least, to take from its merits; all we contend for is, that the same information may be obtained by a pleasanter and an easier method.

It was the great success of Ray's method, that soon after produced such a variety of attempts in the same manner; but almost all less simple, and more obscure. Mr. Klein's method is briefly as follows: he makes the power of changing place, the characteristic mark of animals in general; and he takes their distinctions from their aptitude and fitness for such a change. Some change place by means of feet, or some similar contrivance; others have wings and feet: some can change place only in water, and have only fins: some go upon earth, without any feet at all: some change place, by moving their shell; and some move only at a certain time of the year. Of such, however, as do not move at all, he takes no notice. The quadrupeds that move chiefly by means of four feet upon land, he divides into two orders. The first are the hoofed kind; and the second, the claw kind. Each of these orders is divided into four families. The first family of the hoofed kind, are the singled hoofed, such as the horse, ass, &c. The second family are such as have the hoof cloven into two parts, such as the cow, &c. The third family have the hoof divided into three parts; and in this family is found only the rhinoceros. The fourth family have the hoof divided into five parts; and in this is only to be found the elephant. With respect to the clawed kind, the first family comprehends those that have but two claws on each foot, as the camel; the second family have three claws; the third, four; and the fourth, five. This method of taking the distinctions of animals from the organs of motion, is ingenious; but it is, at the same time, incomplete; and, besides, the divisions into which it must necessarily fall, is inadequate; since, for instance, in his family with two claws, there is but one animal; whereas, in his family with five claws, there are above a hundred.

Brison, who has laboured this subject with great accuracy, divides animated nature into nine classes: namely, quadrupeds; cetaceous animals, or those of the whale kind; birds; reptiles, or those of the serpent kind; cartilaginous fishes; spinous fishes; shelled animals; insects; and worms. He divides the quadrupeds into eighteen orders; and takes their distinctions from the number and form of their teeth.

But of all those whose systems have been adopted and admired Linnæus is the foremost; as, with a studied brevity, his system comprehends the greatest variety in the smallest space.

According to him, the first distinction of animals is to be taken from their internal structure. Some have the heart with two ventricles, and hot red blood; namely, quadrupeds and birds. The quadrupeds are viviparous, and the birds oviparous.

Some have the heart with one ventricle, and cold red blood; namely, amphibia and fishes. The amphibia are furnished with lungs; the fishes, with gills.

Some have the heart with one ventricle, and cold white serum; namely, insects and worms: the insects have feelers; and the worms, holders.

The distinctions of quadrupeds, or animals with paps, as he calls them, are taken from their teeth. He divides them into seven orders; to which he gives names that are not easy of translation: Primates or principles, with four cutting teeth in each jaw; Bruta, or brutes, with no cutting teeth; Feræ, or wild beasts, with generally six cutting teeth in each jaw; Glires, or dormice, with two cutting teeth, both above and below; Pecora, or cattle, with many cutting teeth above, and none below; Belluæ, or beasts, with the fore-teeth blunt; Cetæ, or those of the whale kind, with cartilaginous teeth. I have but just sketched out this system, as being, in its own nature, the closest abridgment; it would take volumes to dilate it to its proper length. The names of the different animals, and their classes, alone make two thick octavo volumes; and yet nothing is given but the slightest description of each. I have omitted all criticism also upon the accuracy of the preceding systems: this has been done both by Buffon and Daubenton, not with less truth than humour; for they had too much good sense not to see the absurdity of multiplying the terms of science to no end, and disappointing our curiosity rather with a catalogue of nature's varieties, than a history of nature.

Instead, therefore, of taxing the memory and teazing the patience with such a variety of divisions and subdivisions, I will take leave to class the productions of nature in the most obvious, though not in the most accurate manner. In natural history, of all other sciences, there is the least danger of obscurity. In morals, or in metaphysics, every definition must be precise, because those sciences are built upon definitions; but it is otherwise in those subjects where the exhibition of the object itself is always capable of correcting the error. Thus, it may often happen that in a lax system of natural history, a creature may be ranked among quadrupeds that belongs more properly to the fish or the insect classes. But that can produce very little confusion, and every reader can thus make a system the most agreeable to his own imagination. It will be of no manner of consequence whether we call a bird or an insect a quadruped, if we are careful in marking all its distinctions: the uncertainty in reasoning, or thinking, that those approximations of the different kinds of animals produce, is but very small, and happens but very rarely; whereas the labour that naturalists have been at to keep the kinds asunder, has been excessive This, in general, has given birth to that variety of systems which we have just mentioned, each of which seems to be almost as good as the preceding.

Taking, therefore, this latitude, and using method only where it contributes to conciseness or perspicuity, we shall divide animated nature into four classes; namely Quadrupeds, Birds, Fishes, and Insects. All these seem in general pretty well distinguished from each other by nature; yet there are several instances in which we can scarce tell whether it is a bird or a quadruped that we are about to examine; whether it is a fish or an insect that offers to our curiosity. Nature is varied by imperceptible gradations, so that no line can be drawn between any two classes of its productions, and no definition made to comprehend them all. However, the distinctions between these classes are sufficiently marked, and their encroachments upon each other are so rare, that it will be sufficient particularly to apprise the reader when they happen to be blended.

There are many quadrupeds that we are well acquainted with; and of those we do not know, we shall form the most clear and distinct conceptions, by being told wherein they differ, and wherein they resemble those with which we are familiar. Each class of quadrupeds may be ranged under some one of the domestic kinds, that may serve for the model by which we are to form some kind of idea of the rest. Thus we may say that a tiger is of the cat kind, a wolf of the dog kind, because there are some rude resemblances between each; and a person who has never seen the wild animals, will have some incomplete knowledge of their figure from the tame ones. On the contrary, I will not, as some systematic writers have done,* say that the bat is of the human kind, or a hog of the horse kind, merely because there is some resemblance in their teeth, or their paps. For although this resemblance may be striking enough, yet a person who has never seen a bat or a hog, will never form any just conception of either, by being told of this minute similitude. In short, the method in classing quadrupeds should be taken from their most striking resemblances and where these do not offer, we should not force the similitude, but leave the animal to be described as a solitary species. The number of quadrupeds is so few, that indeed, without any method whatever, there is no great danger of confusion.

All quadrupeds, the number of which, according to Buffon, amounts to but two hundred, may be classed in the following manner.

First, those of the Horse kind. This class contains the Horse, the Ass, and the Zebra. Of these none have horns, and their hoof is of one solid piece.

The second class are those of the Cow kind; comprehending the Urus, the Buffalo, the Bison, and the Bonassus. These have cloven hoofs, and chew the cud.

The third class is that of the Sheep kind: with cloven hoofs, and chewing the cud, like the former. In this is comprehended the Sheep, the Goat, the Lama, the Vigogne, the Gazelle, the Guinea Deer, and all of a similar form.

The fourth class is that of the Deer kind, with cloven hoofs, and with solid horns, that are shed every year. This class contains the Elk, the Rein-deer, the Stag, the Buck, the Roebuck, and the Axis.

The fifth class comprehends all those of the Hog kind, the Peccari and the Babyrouessa.

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* Linnæi Syst.

The sixth class is that numerous one of the Cat kind. This comprehends the Cat, the Lion, the Panther, the Leopard, the Jaguar, the Cougar, the Jaguarette, the Lynx, the Ounce, and the Catamountain. These are all carnivorous, and furnished with crooked claws, which they can sheath and unsheath at pleasure.

The seventh class is that of the Dog kind, carnivorous, and furnished with claws like the former, but which they cannot sheath. This class comprehends the Dog, the Wolf, the Fox, the Jackall, the Isatis, the Hyæna, the Civet, the Gibet, and the Genet.

The eighth class is that of the Weasel kind, with a long small body, with small toes, or claws, on each foot; the first of them separated from the rest like a thumb. This comprehends the Weasel, the Martin, the Pole-cat, the Ferret, the Mangoust, the Vansire, the Ermine, with all the varieties of the American Moufettes.

The ninth class is that of the Rabbit kind, with two large cutting teeth in each jaw. This comprehends the Rabbit, the Hare, the Guinea-pig, all the various species of the Squirrel, the Dormouse, the Marmotte, the Rat, the Mouse, Agouti, the Paca, the Aperea, and the Tapeti.

The tenth class is that of the Hedge-hog kind, with claw feet, and covered with prickles, comprehending the Hedge-hog, and the Porcupine, the Couando, and the Urson.

The eleventh class is that of the Tortoise kind, covered with a shell, or scales This comprehends the Tortoise, the Pangolin, and the Phataguin.

The twelfth is that of the Otter, or amphibious kind, comprehending the Otter, the Beaver, the Desman, the Morse, and the Seal.

The thirteenth class is that of the Ape and Monkey kinds, with hands, and feet resembling hands.

The fourteenth class is that of winged quadrupeds, or the Bat kind, containing the Bat, the Flying-Squirrel, and some other varieties.

The animals which seem to approach no other kind, either in nature, or in form, but to make each a distinct species in itself, are the following: the Elephant, the Rhinoceros, the Hippopotamus, the Cameleopard, the Camel, the Bear, the Badger, the Tapir, the Cabria, the Coati, the Antbear, the Tatou, and lastly, the Sloth.

All other quadrupeds, whose names are not set down, will be found among some of the above mentioned classes, and referred to that which they most resemble. When, therefore, we are at a loss to know the name of any particular animal, by examining which of the known kinds it most resembles, either in shape, or in hoofs, or claws; and then examining the particular description, we shall be able to discover not only its name, but its history. I have already said that all methods of this kind are merely arbitrary, and that nature makes no exact distinction between her productions. It is hard, for instance, to tell whether we ought to refer the civet to the dog, or the cat kind; but, if we know the exact history of the civet, it is no great matter to which kind we shall judge it to bear the greatest resemblance. It is enough, that a distribution of this kind excites in us some rude outlines of the make, or some marked similitudes in the nature of these animals; but, to know them with any precision, no system, or even description, will serve, since the animal itself, or a good print of it, must be seen, and its history be read at length, before it can be said to be known. To pretend to say that we have an idea of a quadruped, because we can tell the number or the make of its teeth, or its paps, is as absurd as if we should pretend to distinguish men by the buttons of their clothes. Indeed, it often happens that the quadruped itself can be but seldom seen, that many of the more rare kinds do not come into Europe above once in an age, and some of them have never been able to bear the removal; in such a case, therefore, there is no other substitute but a good print of the animal, to give an idea of its figure; for no description whatsoever can answer this purpose so well. Mr. Locke, with his usual good sense, has observed, that a drawing of the animal, taken from the life, is one of the best methods of advancing natural history; and yet, most of our modern systematic writers are content rather with describing. Descriptions, no doubt, will go some way towards giving an idea of the figure of an animal; but they are certainly much the longest way about, and, as they are usually managed, much the most obscure. In a drawing we can, at a single glance, gather more instruction than by a day's painful investigation of methodical systems, where we are told the proportions with great exactness, and yet remain ignorant of the totality. In fact, this method of describing all things is a fault that has infected many of our books that treat on the meaner arts, for this last age. They attempt to teach by words, what is only to be learnt by practice and inspection. Most of our dictionaries, and bodies of arts and sciences, are guilty of this error. Suppose, for instance, it be requisite to mention the manner of making shoes; it is plain that all the verbal instructions in the world will never give an adequate idea of this humble art, or teach a man to become a shoemaker. A day or two in a shoemaker's shop will answer the end better than a whole folio of instruction, which only serves to oppress the learner with the weight of its pretended importance. We have lately seen a laborious work carried on at Paris, with this only intent of teaching all the trades by description; however, the design at first blush seems to be ill considered; and it is probable that very few advantages will be derived from so laborious an undertaking. With regard to the descriptions in natural history, these, without all question, under the direction of good sense, are necessary; but still they should be kept within proper bounds; and, where a thing may be much more easily shown than described, the exhibition should ever precede the account.

CHAPTER XV.

OF QUADRUPEDS IN GENERAL, COMPARED TO MAN.

Upon comparing the various animals of the globe with each other, we shall find that quadrupeds demand the rank immediately next ourselves, and consequently come first in consideration. The similitude between the structure of their bodies and ours, those instincts which they enjoy in a superior degree to the rest, their constant services, or their unceasing hostilities, all render them the foremost objects of our curiosity, and the most interesting parts of animated nature. These, however, although now so completely subdued, very probably, in the beginning, were nearer upon an equality with us, and disputed the possession of the earth. Man, while yet savage himself, was but ill qualified to civilize the forest. While yet naked, unarmed, and without shelter, every wild beast was a formidable rival; and the destruction of such was the first employment of heroes. But when he began to multiply, and arts to accumulate, he soon cleared the plains of the most noxious of these his rivals; a part was taken under his protection and care, while the rest found a precarious refuge in the burning desert, or the howling wilderness.

From being rivals, quadrupeds have now become the assistants of man; upon them he devolves the most laborious employments, and finds in them patient and humble coadjutors, ready to obey, and content with the smallest retribution. It was not, however, without long and repeated efforts that the independent spirit of these animals was broken; for the savage freedom, in wild animals, is generally found to pass down through several generations before it is totally subdued. Those cats and dogs that are taken from a state of natural wildness in the forest, still transmit their fierceness to their young; and, however concealed in general, it breaks out upon several occasions. Thus the assiduity and application of man in bringing them up, not only alters their disposition, but their very forms; and the difference between animals in a state of nature and domestic tameness, is so considerable, that Mr. Buffon has taken this as a principal distinction in classing them.

In taking a cursory view of the form of quadrupeds, we may easily perceive, that of all the ranks of animated nature, they bear the nearest resemblance to man. This similitude will be found more striking when erecting themselves on their hinder feet, they are taught to walk forward in an upright posture. We then see that all their extremities in a manner correspond with ours, and present us with a rude imitation of our own. In some of the ape kind the resemblance is so striking, that anatomists are puzzled to find in what part of the human body man's superiority consists; and scarce any but the metaphysician can draw the line that ultimately divides them.

But if we compare their internal structure with our own, the likeness will be found still to increase, and we shall perceive many advantages they enjoy in common with us, above the lower tribes of nature. Like us, they are placed above the class of birds, by bringing forth their young alive; like us, they are placed above the class of fishes, by breathing through the lungs; like us, they are placed above the class of insects, by having red blood circulating through their veins; and lastly, like us, they are different from almost all the other classes of animated nature, being either wholly or partly covered with hair. Thus nearly are we represented in point of conformation to the class of animals immediately below us; and this shows what little reason we have to be proud of our persons alone, to the perfection of which quadrupeds make such very near approaches.

The similitude of quadrupeds to man obtains also in the fixedness of their nature, and their being less apt to be changed by the influence of climate or food, than the lower ranks of nature.* Birds are found very apt to alter both in colour and size; fishes, likewise, still more; insects may be quickly brought to change and adapt themselves to the climate; and if we descend to plants, which may be allowed to have a kind of living existence, their kinds may be surprisingly and readily altered, and taught to assume new forms. The figure of every animal may be considered as a kind of drapery, which it may be made to put on or off by human assiduity; in man the drapery is almost invariable; in quadrupeds it admits of some variation; and the variety may be made greater still, as we descend to the inferior classes of animal existence.

Quadrupeds, although they are thus strongly marked, and in general divided from the various kinds around them, yet some of them are often of so equivocal a nature, that it is hard to tell whether they ought to be ranked in the quadruped class, or degraded to those below them. If, for instance, we were to marshal the whole group of animals round man, placing the most perfect next him, and those most equivocal near the classes they most approach, we should find it difficult, after the principal had taken their stations near him, where to place many that lie at the out-skirts of this phalanx. The bat makes a near approach to the aerial tribe, and might, by some, be reckoned among the birds. The porcupine has not less pretensions to that class, being covered with quills, and showing that birds are not the only part of nature that are furnished with such a defence. The armadillo might be referred to the tribe of insects, or snails, being, like them, covered with a shell; the seal and the morse might be ranked among the fishes, like them being furnished with fins, and almost constantly residing in the same element. All these, the farther they recede from the human figure, become less perfect, and may be considered as the lowest kinds of that class to which we have referred them.

But although the variety in quadrupeds is thus great, they all seem well adapted to the stations in which they are placed. There is scarce one of them, how rudely shaped soever, that is not formed to enjoy a state of happiness fitted to its nature. All its deformities are only relative to us, but all its enjoyments are peculiarly its own. We may superficially suppose the sloth, that takes up months in climbing a single tree, or the mole, whose eyes are too small for distinct vision, are wretched and helpless creatures; but it is probable that their life, with respect to themselves, is a life of luxury; the most pleasing food is easily obtained; and as they are abridged in one pleasure, it may be doubled in those which remain. Quadrupeds, and all the lower kinds of animals, have, at worst, but the torments of immediate evil to encounter, and this is but transient and accidental; man has two sources of calamity, that which he foresees, as well as that which he feels; so that if his reward were to be in this life alone, then indeed would he be of all beings the most wretched.

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* Buffon, vol. xviii. p. 179.

The heads of quadrupeds, though differing from each other, are, in general, adapted to their way of living. In some it is sharp, the better to fit the animal for turning up the earth in which its food lies. In some it is long, in order to give a greater room for the olfactory nerves, as in dogs, who are to hunt and find out their prey by the scent. In others it is short and thick, as in the lion, to increase the strength of the jaw, and to fit it the better for combat. In quadrupeds that feed upon grass, they are enabled to hold down their heads to the ground, by a strong tendinous ligament, that runs from the head to the middle of the back. This serves to raise the head, although it has been held to the ground for several hours, without any labour, or any assistance from the muscles of the neck.

The teeth of all animals are entirely fitted to the nature of their food. Those of such as live upon flesh differ in every respect from such as live upon vegetables. In the latter, they seem entirely made for gathering and bruising their simple food, being edged before, and fitted for cutting; but broad towards the back of the jaw, and fitted for pounding. In the carnivorous kinds, they are sharp before, and fitted rather for holding than dividing. In the one the teeth serve as grindstones; in the other as weapons of defence; in both, however, the surface of those teeth which serve for grinding, are unequal; the cavities and risings fitting those of the opposite, so as to tally exactly when the jaws are brought together. These inequalities better serve for comminuting the food; but they become smooth with age; and, for this reason, old animals take a longer time to chew their food than such as are in the vigour of life.

Their legs are not better fitted than their teeth to their respective wants or enjoyments. In some they are made for strength only, and to support a vast unwieldy frame, without much flexibility or beautiful proportion. Thus the legs of the elephant, the rhinoceros, and the sea-horse, resemble pillars; were they made smaller, they would be unfit to support the body; were they endowed with greater flexibility, or swiftness, that would be needless, as they do not pursue other animals for food; and, conscious of their own superior strength, there are none that they deign to avoid. Deers, hares, and other creatures, that are to find safety only in flight, have their legs made entirely for speed; they are slender and nervous. Were it not for this advantage, every carnivorous animal would soon make them a prey, and their races would be entirely extinguished. But, in the present state of nature, the means of safety are rather superior to those of offence; and the pursuing animal must owe success only to patience, perseverance, and industry. The feet of some, that live upon fish alone, are made for swimming. The toes of these animals are joined together with membranes, being web-footed, like a goose or a duck, by which they swim with great rapidity. Those animals that lead a life of hostility, and live upon others, have their feet armed with sharp claws, which some can sheath and unsheath at will. Those, on the contrary who lead peaceful lives, have generally hoofs, which serve some as weapons of defence; and which, in all, are better fitted for traversing extensive tracts of rugged country, than the claw-foot of their pursuers.

The stomach is generally proportioned to the quality of the animal's food, or the ease with which it is obtained. In those that live upon flesh, and such nourishing substances, it is small and glandular, affording such juices as are best adapted to digest its contents; their intestines, also, are short, and without fatness. On the contrary, such animals as feed entirely upon vegetables, have the stomach very large; and those who chew the cud have no less than four stomachs, all which serve as so many laboratories, to prepare and turn their coarse food into proper nourishment. In Africa, where the plants afford greater nourishment than in our temperate climates, several animals, that with us have four stomachs, have there but two.* However, in all animals the size of the intestines are proportioned to the nature of the food; where that is furnished in large quantities, the stomach dilates to answer the increase. In domestic animals, that are plentifully supplied, it is large; in the wild animals, that live precariously, it is much more contracted, and the intestines are much shorter.

In this manner, all animals are fitted by nature to fill up some peculiar station. The greatest animals are made for an inoffensive life, to range the plains and the forest without injuring others; to live upon the productions of the earth, the grass of the field, or the tender branches of trees These, secure in their own strength, neither fly from any other quadrupeds nor yet attack them: nature, to the greatest strength, has added the most gentle and harmless dispositions; without this, those enormous creatures would be more than a match for all the rest of the creation; for what devastation might not ensue were the elephant, or the rhinoceros, or the buffalo, as fierce and as mischievous as the tiger or the rat? In order to oppose these larger animals, and in some measure to prevent their exuberance, there is a species of the carnivorous kind, of inferior strength indeed, but of greater activity and cunning. The lion and the tiger generally watch for the larger kinds of prey, attack them at some disadvantage, and commonly jump upon them by surprise. None of the carnivorous kinds, except the dog alone, will make a voluntary attack, but with the odds on their side. They are all cowards by nature, and usually catch their prey by a bound from some lurking place, seldom attempting to invade them openly; for the larger beasts are too powerful for them, and the smaller too swift.

A lion does not willingly attack a horse; and then only when compelled by the keenest hunger. The combats between a lion and a horse are frequent enough in Italy; where they are both inclosed in a kind of amphitheatre, fitted for that purpose. The lion always approaches wheeling about, while the horse presents his hinder parts to the enemy. The lion in this manner goes round and round, still narrowing his circle, till he comes to the proper distance to make his spring; just at the time the lion springs, the horse lashes with both legs from behind, and, in general, the odds are in his favour: it more often happening that the lion is stunned, and struck motionless by the blow, than that he effects his jump between the horse's shoulders. If the lion is stunned, and left sprawling, the horse escapes, without attempting to improve his victory; but if the lion succeeds, he sticks to his prey, and tears the horse in pieces in a very short time.

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* Buffon

But it is not among the larger animals of the forest alone, that these hostilities are carried on; there is a minuter, and a still more treacherous contest between the lower rank of quadrupeds. The panther hunts for the sheep and the goat; the catamountain for the hare or the rabbit; and the wild-cat for the squirrel or the mouse. In proportion as each carnivorous animal wants strength, it uses all the assistance of patience, assiduity, and cunning. However, the arts of these to pursue, are not so great as the tricks of their prey to escape; so that the power of destruction in one class is inferior to the power of safety in the other. Were this otherwise, the forest would soon be dispeopled of the feebler races of animals; and beasts of prey themselves, would want, at one time, that subsistence which they lavishly destroyed at another.

Few wild animals seek their prey in the day-time; they are then generally deterred by their fears of man in the inhabited countries, and by the excessive heat of the sun in those extensive forests that lie towards the south, and in which they reign the undisputed tyrants. As soon, therefore, as the morning appears, the carnivorous animals retire to their dens; and the elephant, the horse, the deer, and all the hare kinds, those inoffensive tenants of the plain, make their appearance. But again, at night-fall, the state of hostility begins; the whole forest then echoes to a variety of different howlings. Nothing can be more terrible than an African landscape at the close of evening; the deep-toned roarings of the lion; the shriller yellings of the tiger; the jackall, pursuing by the scent, and barking like a dog; the hyena, with a note peculiarly solitary and dreadful; but above all, the hissing of the various kinds of serpents that then begin their call, and, as I am assured, make a much louder symphony than the birds in our groves in a morning.

Beasts of prey seldom devour each other; nor can any thing but the greatest degree of hunger induce them to it. What they chiefly seek after, is the deer, or the goat; those harmless creatures, that seem made to embellish nature. These are either pursued or surprised, and afford the most agreeable repast to their destroyers. The most usual method with even the fiercest animals, is to hide and crouch near some path frequented by their prey; or some water where cattle come to drink; and seize them at once with a bound. The lion and the tiger leap twenty feet at a spring; and this, rather than their swiftness or strength, is what they have most to depend upon for a supply. There is scarce one of the deer or hare kind, that is not very easily capable of escaping them by its swiftness; so that whenever any of these fall a prey, it must be owing to their own inattention.

But there is another class of the carnivorous kind, that hunt by the scent, and which it is much more difficult to escape. It is remarkable that all animals of this kind pursue in a pack; and encourage each other by their mutual cries. The jackall, the syagush, the wolf, and the dog, are of this kind; they pursue with patience rather than swiftness; their prey flies at first, and leaves them for miles behind; but they keep on with a constant steady pace, and excite each other by a general spirit of industry and emulation, till at last they share the common plunder. But it too often happens, that the larger beasts of prey, when they hear a cry of this kind begun, pursue the pack, and when they have hunted down the animal, come in and monopolize the spoil. This has given rise to the report of the jackall's being the lion's provider; when the reality is, that the jackall hunts for itself, and the lion is an unwelcome intruder upon the fruit of his toil.

Nevertheless, with all the powers which carnivorous animals aré possessed of, they generally lead a life of famine and fatigue. Their prey has such a variety of methods for escaping, that they sometimes continue without food for a fortnight together: but nature has endowed them with a degree of patience equal to the severity of their state; so that as their subsistence is precarious, their appetites are complying. They usually seize their prey with a roar, either of seeming delight, or perhaps to terrify it from resistance. They frequently devour it, bones and all, in the most ravenous manner; and then retire to their dens, continuing inactive till the calls of hunger again excite their courage and industry. But as all their methods of pursuit are counteracted by the arts of evásion, they often continue to range without success, supporting a state of famine for several days, nay, sometimes weeks together. Of their prey, some find protection in holes, in which nature has directed them to bury themselves; some find safety by swiftness; and such as are possessed of neither of these advantages, generally herd together, and endeavour to repel invasion by united force. The very sheep, which to us seem so defenceless, are by no means so in a state of nature; they are furnished with arms of defence, and a very great degree of swiftness; but they are still further assisted by their spirit of mutual defence: the females fall into the centre; and the males, forming a ring round them, oppose their horns to the assailants. Some animals that feed upon fruits which are to be found only at one time of the year, fill their holes with several sorts of plants, which enable them to lie concealed during the hard frosts of the winter, contented with their prison, since it affords them plenty and protection. These holes are dug with so much art, that there seems the design of an architect in the formation. There are usually two apertures, by one of which the little inhabitant can always escape, when the enemy is in possession of the other. Many creatures are equally careful of avoiding their enemies, by placing a sentinel to warn them of the approach of danger. These generally perform this duty by turns; and they know how to punish such as have neglected their post, or have been unmindful of the common safety. Such are a part of the efforts that the weaker races of quadrupeds exert, to avoid their invaders; and, in general, they are attended with success. The arts of instinct are most commonly found an overmatch for the invasions of instinct. Man is the only creature against whom all their little tricks cannot prevail. Wherever he has spread his dominion, scarce any flight can save, or any retreat harbour; wherever he comes, terror seems to follow, and all society ceases among the inferior ten ants of the plain; their union against him can yield them no protection, and their cunning is but weakness. In their fellow brutes, they have an enemy whom they can oppose with an equality of advantage they can oppose fraud or swiftness to force; or numbers to invasion but what can be done against such an enemy as man, who finds them out, though unseen, and though remote, destroys them? Wherever he comes, all the contest among the meaner ranks seems to be at an end, or is carried on only by surprise. Such as he has thought proper to protect, have calmly submitted to his protection; such as he has found it convenient to destroy, carry on an unequal war, and their numbers are every day decreasing.

The wild animal is subject to few alterations; and, in a state of savage nature, continues for ages the same, in size, shape, and colour. But it is otherwise when subdued, and taken under the protection of man; its external form, and even its internal structure, are altered by human assiduity: and this is one of the first and greatest causes of the variety that we see among the several quadrupeds of the same species. Man appears to have changed the very nature of domestic animals, by cultivation and care. A domestic animal is a slave that seems to have few other desires but such as man is willing to allow it. Humble, patient, resigned, and attentive, it fills up the duties of its station; ready for labour, and content with subsistence.

Almost all domestic animals seem to bear the marks of servitude strong upon them. All the varieties in their colour, all the fineness and length of their hair, together with the depending length of their ears, seem to have arisen from a long continuance of domestic slavery. What an immense variety is there to be found in the ordinary race of dogs and horses! the principal differences of which have been effected by the industry of man, so adapting the food, the treatment, the labour, and the climate, that nature seems almost to have forgotten her original design; and the tame animal no longer bears any resemblance to its ancestors in the woods around them.

In this manner nature is under a kind of constraint, in those animals we have taught to live in a state of servitude near us. The savage animals preserve the marks of their first formation; their colours are generally the same; a rough dusky brown, or a tawny, seem almost their only varieties. But it is otherwise in the tame; their colours are various, and their forms different from each other. The nature of the climate, indeed, operates upon all; but more particularly on these. That nourishment which is prepared by the hand of man, not adapted to their appetites, but to suit his own convenience, that climate, the rigours of which he can soften, and that employment to which they are sometimes assigned, produce a number of distinctions that are not to be found among the savage animals. These at first were accidental, but in time became hereditary; and a new race of artificial monsters are propagated, rather to answer the purposes of human pleasure, than their own convenience. In short, their very appetites may be changed; and those that feed only upon grass may be rendered carnivorous. I have seen a sheep that would eat flesh, and a horse that was fond of oysters.

But not their appetites, or their figure alone, but their very dispositions, and their natural sagacity, are altered by the vicinity of man In those countries where men have seldom intruded, some animals have been found, established in a kind of civil state of society. Remote from the tyranny of man, they seem to have a spirit of mutual benevolence, and mutual friendship. The beavers, in these distant solitudes, are known to build like architects, and rule like citizens. The habitations that these have been seen to erect, exceed the houses of the human inhabitants of the same country, both in neatness and convenience. But as soon as man intrudes upon their society, they seem impressed with the terrors of their inferior situation, their spirit of society ceases, the bond is dissolved, and every animal looks for safety in solitude, and there tries all its little industry to shift only for itself.

Next to human influence, the climate seems to have the strongest effects both upon the nature and form of quadrupeds. As in man, we have seen some alterations, produced by the variety of his situation; so in the lower ranks, that are more subject to variation, the influence of climate is more readily perceived. As these are more nearly attached to the earth, and in a manner connected to the soil; as they have none of the arts of shielding off the inclemency of the weather, or softening the rigours of the sun, they are consequently more changed by variations. In general, it may be remarked, that the colder the country, the larger and the warmer is the fur of each animal; it being wisely provided by nature, that the inhabitant should be adapted to the rigours of its situation. Thus, the fox and wolf, which in temperate climates have but short hair, have a fine long fur in the frozen regions, near the pole. On the contrary, those dogs which with us have long hair, when carried to Guinea, or Angola, in a short time cast their thick covering, and assume a lighter dress, and one more adapted to the warmth of the country. The beaver, and the ermine, which are found in the greatest plenty in the cold regions, are remarkable for the warmth and delicacy of their furs; while the elephant, and the rhinoceros, that are natives of the line, have scarce any hair. Not but that human nature can, in some measure, co-operate with, or repress the effects of climate in this particular. It is well known what alterations are produced, by proper care, in the sheep's fleece, in different parts of our own country; and the same industry is pursued with a like success in Syria, where many of their animals are clothed with a long and beautiful hair, which they take care to improve, as they work it into that stuff called camblet, so well known in different parts of Europe.

The disposition of the animal seems also not less marked by the climate than the figure. The same causes that seem to have rendered the human inhabitants of the rigorous climates savage and ignorant, have also operated upon their animals. Both at the line and the pole, the wild quadrupeds are fierce and untameable In these latitudes, their savage dispositions having not been quelled by any afforts from man, and being still farther stimulated by the severity of the weather, they continue fierce and untractable. Most of the attempts which have hitherto been made to tame the wild beasts brought home from the pole or the equator, have proved ineffectual. They are gentle and harmless enough while young; but as they grow up, they acquire their natural ferocity, and snap at the hand that feeds them. It may indeed, in general, be asserted, that in all countries where the men are most barbarous, the beasts are most fierce and cruel: and this is but a natural consequence of the struggle between man and the more savage animals of the forest; for in proportion as he is weak and timid, they must be bold and intrusive; in proportion as his dominion is but feebly supported, their rapacity must be more obnoxious. In the extensive countries, therefore, lying round the pole, or beneath the line, the quadrupeds are fierce and formidable. Africa has ever been remarked for the brutality of its men, and the fierceness of its animals: its lions and its leopards are not less terrible than its crocodiles and its serpents; their dispositions seem entirely marked with the rigours of the climate, and being bred in an extreme of heat, they show a peculiar ferocity, that neither the force of man can conquer, nor his arts allay. However, it is happy for the wretched inhabitants of those climates, that its most formidable animals are all solitary ones; that they have not learnt the art of uniting, to oppress mankind; but each depending on its own strength, invades without any assistant.

The food also is another cause in the variety, which we find among quadrupeds of the same kind. Thus the beasts which feed in the valley are generally larger than those which glean a scanty subsistence on the mountain. Such as live in the warm climates, where the plants are much larger and more succulent than with us, are equally remarkable for their bulk. The ox fed in the plains of Indostan, is much larger than that which is more hardly maintained on the side of the Alps. The deserts of Africa, where the plants are extremly nourishing, produce the largest and fiercest animals; and, perhaps for a contrary reason, America is found not to produce such large animals as are seen in the ancient continent. But, whatever be the reason, the fact is certain, that while America exceeds us in the size of its reptiles of all kinds, it is far inferior in its quadruped productions. Thus, for instance, the largest animal of that country is the tapir, which can by no means be compared to the elephant of Africa. Its beasts of prey also, are devested of that strength and courage which is so dangerous in this part of the world. The American lion, tiger, and leopard, if such diminutive creatures deserve these names, are neither so fierce nor so valiant as those of Africa and Asia. The tiger of Bengal has been seen to measure twelve feet in length, without including the tail; whereas the American tiger seldom exceeds three. This difference obtains still more in the other animals of that country, so that some have been of opinion* that all the quadrupeds in Southern America are of a different species from those most resembling them in the old world; and that there are none which are common to both but such as have entered America by the north; and which, being able to bear the rigours of the frozen pole, have travelled from the ancient continent, by that passage, into the new. Thus the bear, the wolf, the elk,

* Buffon.

the stag, the fox, and the beaver, are known to the inhabitants as well of North America as of Russia; while most of the various kinds to the southward, in both continents, bear no resemblance to each other. Upon the whole, such as peculiarly belong to the new continent, are without any marks of the quadruped perfection. They are almost wholly destitute of the power of defence; they have neither formidable teeth, horns, or tail; their figure is awkward, and their limbs ill proportioned. Some among them, such as the ant-bear, and the sloth, appear so miserably formed, as scarce to have the power of moving and eating. They seemingly drag out a miserable and languid existence in the most desert solitude, and would quickly have been destroyed in a country where there were inhabitants, or powerful beasts to oppose them.

But, if the quadrupeds of the new continent be less, they are found in much greater abundance; for it is a rule that obtains through nature, that the smallest animals multiply the fastest. The goat, imported from Europe to South America, soon begins to degenerate; but as it grows less it becomes more prolific; and, instead of one kid at a time, or two at the most, it generally produces five, and sometimes more. What there is in the food, or the climate, that produces this change, we have not been able to learn; we might be apt to ascribe it to the heat, but that on the African coast, where it is still hotter, this rule does not obtain; for the goat, instead of degenerating there, seems rather to improve.

However, the rule is general among all quadrupeds, that those which are large and formidable produce but few at a time; while such as are mean and contemptible are extremely prolific. The lion, or tiger, have seldom above two cubs at a litter; while the cat, that is of a similar nature, is usually seen to have five or six. In this manner the lower tribes become extremely numerous; and, but for this surprising fecundity, from their natural weakness they would quickly be extirpated. The breed of mice, for instance, would have long since been blotted from the earth, were the mouse as slow in the production as the elephant. But it has been wisely provided that such animals as can make but little resistance, should at least have a means of repairing the destruction which they must often suffer by their quick reproduction; that they should increase even among enemies, and multiply under the hand of the destroyer. On the other hand, it has as wisely been ordered by Providence, that the larger kinds should produce but slowly; otherwise, as they require proportional supplies from nature, they would quickly consume their own store; and, of consequence, many of them would soon perish through want; so that life would thus be given without the necessary means of subsistence. In a word, Providence has most wisely balanced the strength of the great against the weakness of the little. Since it was necessary that some should be great and others mean, since it was expedient that some should live upon others, it has assisted the weakness of the one by granting it fruitfulness; and diminished the number of the other by infecundity

In consequence of this provision, the larger creatures, which bring forth few at a time, seldom begin to generate till they have nearly acquired their full growth. On the contrary, those which bring many, reproduce before they have arrived at half their natural size. Thus the horse and the bull are nearly at their best before they begin to breed; the hog and the rabbit scarce leave the teat before they become parents in turn. Almost all animals likewise continue the time of their pregnancy in proportion to their size. The mare continues eleven months with foal, the cow nine, the wolf five, and the bitch nine weeks. In all, the intermediate litters are the most fruitful; the first and the last generally producing the fewest in number, and the worst of the kind.

Whatever be the natural disposition of animals at other times, they all acquire new courage when they consider themselves as defending their young. No terrors can then drive them from the post of duty; the mildest begin to exert their little force, and resist the most formidable enemy. Where resistance is hopeless, they then incur every danger, in order to rescue their young by flight, and retard their own expedition by providing for their little ones. When the female opossum, an animal of America, is pursued, she instantly takes her young into a false belly, with which nature has supplied her, and carries them off, or dies in the endeavour. I have been lately assured of a she-fox, which, when hunted, took her cub in her mouth, and run for several miles without quitting it, until at last she was forced to leave it behind, upon the approach of a mastiff, as she ran through a farmer's yard. But, if at this period the mildest animals acquire new fierceness, how formidable must those be that subsist by rapine! At such times no obstacles can stop their ravage, nor no threats can terrify; the lioness then seems more hardy than even the lion himself. She attacks men and beasts indiscriminately, and carries all she can overcome reeking to her cubs, whom she thus early accustoms to slaughter. Milk, in the carnivorous animals, is much more sparing than in others; and it may be for this reason that all such carry home their prey alive, that, in feeding their young, its blood may supply the deficiencies of nature, and serve instead of that milk with which they are so sparingly supplied.

Nature, that has thus given them courage to defend their young, has given them instinct to choose the proper times of copulation, so as to bring forth when the provision suited to each kind is to be found in the greatest plenty. The wolf, for instance, couples in December, so that the time of pregnancy continuing five months, it may have its young in April. The mare, who goes eleven months, admits the horse in summer, in order to foal about the beginning of May. On the contrary, those animals which lay up provisions for the winter, such as the beaver and the marmotte, couple in the latter end of autumn, so as to have their young about January, against which season they have provided a very comfortable store. These seasons for coupling, however, among some of the domestic kinds, are generally in consequence of the quantity of provisions with which they are at any time supplied. Thus we may, by feeding any of these animals, and keeping off the rigour of the climate, make them breed whenever we please. In this manner, those contrive who produce lambs all the year round

The choice of situation in bringing forth is also very remarkable. In most of the rapacious kinds, the female takes the utmost precautions to hide the place of her retreat from the male, who otherwise, when pressed by hunger, would be apt to devour her cubs. She seldom, therefore, strays far from the den, and never approaches it while he is in view, nor visits him again till her young are capable of providing for themselves. Such animals as are of tender constitutions, take the utmost care to provide a place of warmth, as well as safety, for their young; the rapacious kinds bring forth in the thickest woods; those that chew the cud, with the various tribes of the vermin kind, choose some hiding-place in the neighbourhood of man. Some dig holes in the ground; some choose the hollow of a tree; and all the amphibious kinds bring up their young near the water, and accustom them betimes to their proper element.

Thus nature seems kindly careful for the protection of the meanest of her creatures: but there is one class of quadrupeds that seems entirely left to chance, that no parent stands forth to protect, nor no instructor leads, to teach the arts of subsistence. These are the quadrupeds that are brought forth from the egg, such as the lizard, the tortoise, and the crocodile. The fecundity of all other animals, compared with these, is sterility itself. These bring forth above two hundred at a time; but, as the offspring is more numerous, the parental care is less exerted. Thus the numerous brood of eggs are, without farther solicitude, buried in the warm sands of the shore, and the heat of the sun alone is left to bring them to perfection. To this perfection they arrive almost as soon as disengaged from the shell. Most of them, without any other guide than instinct, immediately make to the water. In their passage thither, they have numberless enemies to fear. The birds of prey that haunt the shore, the beasts that accidentally come there, and even the animals that give them birth, are known, with a strange rapacity, to thin their numbers as well as the rest.

But it is kindly ordered by Providence, that these animals, which are mostly noxious, should thus have many destroyers; were it not for this, by their extreme fecundity, they would soon overrun the earth, and cumber all our plains with deformity.

END OF THE FIRST VOLUME.

A

HISTORY

OF

THE EARTH

AND

ANIMATED NATURE.

BY

OLIVER GOLDSMITH, M. B.

A NEW EDITION,
WITH CORRECTIONS AND ALTERATIONS.

IN FOUR VOLUMES.
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CONTENTS.

VOL. II

BOOK I.

ANIMALS OF THE HORSE KIND.

Page.
CHAP. I. The Horse 5
CHAP. II. The Ass 17
CHAP III. The Zebra 22

BOOK II.

RUMINATING ANIMALS.

CHAP. I. Introduction . . . 27
CHAP. II. The Cow Kind . . 29
The Buffalo . . . 36
CHAP. III. Animals of the Sheep and Goat Kind 39
The Sheep 40
The Goat and its numerous Varieties 45
The Gazelles . . . 52
CHAP. IV. The Musk Animal 58
CHAP. V. Animals of the Deer kind . . . 60
The Fallow Deer 72
The Roe buck . . 74
The Elk 77
The Rein-Deer . . 81

BOOK III.

QUADRUPEDS OF THE HOG KIND.

CHAP. I. Introduction . . . 89
The Wild Boar . . ib.
The Hog 91
CHAP. II. The Peccary, or Tajacu 93
CHAP. III. The Capibara or Cabiai 96
CHAP. IV. The Babyrouessa, or Indian Hog . 97

BOOK IV.

CARNIVOROUS ANIMALS.

Page.
CHAP. I. Animals of the Cat Kind . . 100
The Lion . . . 105
The Tiger 113
The Panther and the Leopard . . 119
CHAP. II. Animals of the Dog Kind . . . 126
The Wolf 140
The Fox 146
The Jackal . . . 150
The Isatis 152
The Hyæna . . . 153
CHAP. III. Animals of the Weasel Kind . 155
The Ermine, or Stoat . . . . . [illegible]
The Ferret . . . 160
The Polecat . . . 162
The Martin . . . 163
The Sable 165
The Ichneumon . 167
The Stinkards . . 168
The Genet . . . 171
The Civit . . . 172
The Glutton . 174

BOOK V.

ANIMALS OF THE HARE KIND

CHAP. I. Introduction . . . 178
The Hare 179
The Rabbit . . . 183
The Squirrel . . [illegible]

The Flying Squirrel 191
The Marmouth . 192
The Agouti . . . 195
The Paca 197
The Guinea-Pig 199

BOOK VI.

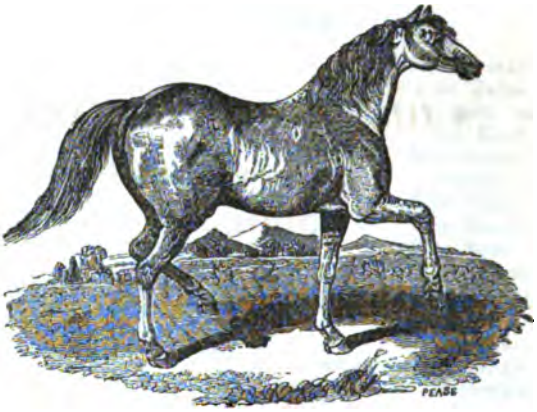
ANIMALS OF THE RAT, & HEDGEHOG, KINDS.

CHAP. I. The Rat Kind . . 202
The Great Rat . ib.
The Mouse . . . 205
The Dormouse . 207
The Musk-Rat . ib.
The Cricetus . . 209
The Leming . . . 210
The Mole 212
CHAP. II. The Hedgehog, or Prickly Kind 215
The Tanrec and Tendrac 218
The Porcupine . 219
CHAP. III. Quadrupeds covered with scales or shells instead of hair 222
The Pangolin . . 223
The Armadillo, or Tatou . 225
CHAP. IV. Animals of the Bat Kind . . . 228
CHAP. V. Amphibious Quadrupeds 233
The Otter 234
The Beaver . . . 237
The Seal 241
The Morse . . 246
The Manati . . 247

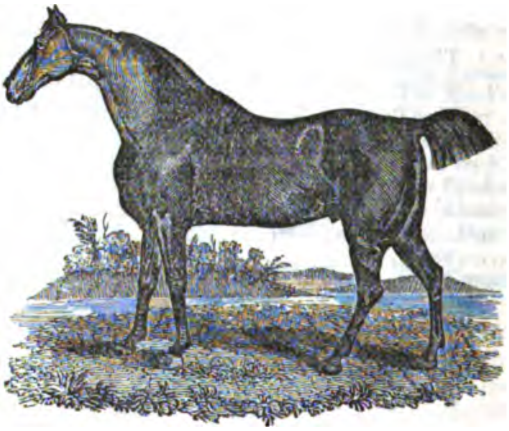
BOOK VII.

THE MONKEY KIND, AND OF THE ELEPHANT, RHINOCEROS, &c.

CHAP. I. Animals of the Monkey Kind 249
The Ouran Outang 250
The Baboon. . . 257
The Monkey . . 260
The Maki 268
The Oppossum and its Kinds . 270
CHAP. II. The Elephant . . 273
CHAP. III. The Rhinoceros . 285
CHAP. IV. The Hippopotamos 288
CHAP. V. The Camelopard 290



Wellesley Arabian, p. 8.



English Hunter, p. 14.

Race Horse (Flying Childers), p. 15.

To face p. 5, vol. ii.

A HISTORY OF ANIMALS.

BOOK I.

ANIMALS OF THE HORSE KIND

CHAPTER I.

OF THE HORSE.[*]

Animals of the horse kind deserve a place next to man in a History of Nature. Their activity, their strength, their usefulness, and their beauty, all contribute to render them the principal objects of our curiosity and care; a race of creatures in whose welfare we are interested next to our own.

Of all the quadruped animals, the horse seems the most beautiful: the noble largeness of his form, the glossy smoothness of his skin, the graceful ease of his motions, and the exact symmetry of his shape, have taught us to regard him as the first, and as the most perfectly formed; and yet, what is extraordinary enough, if we examine him internally, his structure will be found the most different from that of man of all other quadrupeds whatsoever. As the ape approaches us the nearest in internal conformation, so the horse is the most remote;[†] a striking proof that there may be oppositions of beauty, and that all grace is not to be referred to one standard.

To have an idea of this noble animal in his native simplicity, we are not to look for him in the pastures or the stables, to which he has been consigned by man; but in those wild and extensive plains where he has been originally produced; where he ranges without control, and riots in all the variety of luxurious Nature. In this state of happy indepen dence, he disdains the assistance of man, which only tends to servitude. In those boundless tracts, whether of Africa or New Spain, where he runs at liberty, he seems no way incommoded with the inconveniences to which he is subject in Europe. The continual verdure of the fields supplies his wants; and the climate, that never knows a winter, suits his constitution, which naturally seems adapted to heat. His enemies of the forest are but few, for none but the greater kinds will venture to attack him; any one of these he is singly able to overcome; while, at the same time, he is content to find safety in society; for the wild horses of those countries always herd together.

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[*] As it may happen that in a description where it is the aim rather to insert what is not usually known, than all that is known, some of the more obvious particulars may be omitted; I will take leave to subjoin in the notes the characteristic marks of each animal, as given us by Linnæus. "The horse, with six cutting teeth before, and single-hoofed; a native of Europe and the East (but I rather believe of Africa): a generous, proud, and strong animal; fit either for the draught, the course, or the road; he is delighted with woods; he takes care of his hinder parts; defends himself from the flies with his tail; scratches his fellow; defends its young; calls by neighing; sleeps after night-fall; fights by kicking, and by biting also; rolls on the ground when he sweats; eats the grass closer than the ox; distributes the seed by dunging; wants a gall bladder; never vomits; the foal is produced with the feet stretched out; he is injured by being struck on the ear; upon the stifle; by being caught by the nose in barnacles; by having his teeth rubbed with tallow; by the herb padus; by the herb phalandria; by the cruculio; by the conops. His diseases are different in different countries. A consumption of the ethmoid bones of the nose, called the *glanders*, is with us the most infectious and fatal. He eats hemlock without injury. The mare goes with foal 290 days. The placenta is not fixed. He acquires not the canine teeth till the age of five years."

[†] Histoire Naturelle, Daubenton, vol. vii. p 374.

In these countries, therefore, the horses are often seen feeding in droves of five or six hundred. As they do not carry on war against any other race of animals, they are satisfied to remain entirely upon the defensive. The pastures on which they live, satisfy all their appetites, and all other precautions are purely for their security, in case of a surprise. As they are never attacked but at a disadvantage, when ever they sleep in the forests, they have always one among their number that stands as centinel, to give notice of any approaching danger; and this office they take by turns.* If a man approaches them while they are feeding by day, their centinel walks up boldly near him, as if to examine his strength, or to intimidate him from proceeding; but if the man approaches within pistol shot, the centinel then thinks it high time to alarm his fellows; this he does by a loud kind of snorting, upon which they all take the signal, and fly off with the speed of the wind; their faithful centinel bringing up the rear.†

It is not easy to say from what country the horse came originally. It should seem that the colder climates do not agree with his constitution; for although he is found almost in them all, yet his form is altered there, and he is found at once diminutive and ill-shaped. We have the testimony of the ancients that there were wild horses once in Europe; at present, however, they are totally brought under subjection; and even those which are found in America are of a Spanish breed, which being sent thither upon its first discovery, have since become wild, and have spread over all the south of that vast continent, almost to the straits of Magellan. These, in general, are a small breed, of about fourteen hands high. They have thick jaws and clumsy joints; their ears and neck, also, are long; they are easily tamed; for the horse, by nature, is a gentle, complying creature, and resists rather from fear than obstinacy. They are caught by a kind of noose, and then held fast by the legs, and tied to a tree, where they are left for two days without food or drink. By that time they begin to grow manageable; and in some weeks they become as tame as if they had never been in a state of wildness. If, by any accident, they are once more set at liberty, they never become wild again, but know their masters, and come to their call. Some of the buccaneers have often been agreeably surprised, after a long absence, to see their faithful horses once more present themselves, with their usual assiduity; and come up, with a fond submission, to receive the rein.

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* Dictionaire Universelle Des Animaux, p. 19

† Labat, tome vii.

These American horses, however, cannot properly be ranked among the wild races, since they were originally bred from such as were tame. It is not in the new, but the old world that we are to look for this animal in a true state of nature; in the extensive deserts of Africa, in Arabia, and those wide spread countries that separate Tartary from the more southern nations. Vast droves of these animals are seen wild among the Tartars: they are of a small breed, extremely swift, and very readily evade their pursuers. As they go together, they will not admit of any strange animals among them, though even of their own kind. Whenever they find a tame horse attempting to associate with them, they instantly gather round him, and soon oblige him to seek safety by flight. There are vast numbers also of wild horses to the north of China, but they are of a weak, timid breed; small of stature, and useless in war.

At the Cape of Good Hope there are numbers of horses, in a state of nature, but small, vicious, and untameable. They are found wild, also, in several other parts of Africa; but the wretched inhabitants of that country either want the art to tame them, or seem ignorant of their uses. It is common with the Negroes, who are carried over from thence to America, when they first see a horse, to testify both terror and surprise. These poor men seem not to have any knowledge of such a creature; and, though the horse is probably a native of their own country, they have let all the rest of mankind enjoy the benefit of his services, without turning them to any advantage at home. In some parts of Africa, therefore, where the horse runs wild, the natives seem to consider him rather in the light of a dainty for food, than a useful creature, capable of assisting them either in war or labour: riding seems a refinement that the natives of Angola or Caffraria have not as yet been able to attain to; and whenever they catch a horse, it is only with an intent to eat him.

But of all countries in the world, where the horse runs wild, Arabia produces the most beautiful breed, the most generous, swift, and persevering. They are found, though not in great numbers, in the deserts of that country; and the natives use every stratagem to take them. Although they are active and beautiful, yet they are not so large as those that are bred up tame; they are of a brown colour, their mane and tail very short, and the hair black and tufted.* Their swiftness is incredible; the attempt to pursue them in the usual manner of the chase, with dogs, would be entirely fruitless. Such is the rapidity of their flight, that they are instantly out of view, and the dogs themselves give up the vain pursuit. The only method, therefore, of taking them, is by traps, hidden in the sand, which entangling their feet, the hunter at length comes up, and either kills them or carries them home alive. If the horse be young, he is considered among the Arabians as a very great delicacy; and they feast upon him while any part is found remaining; but if, from his shape or vigour, he promises to be serviceable in his more noble capacity, they take the usual methods of taming him, by fatigue and hunger, and he soon becomes a useful domestic animal.

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* Marm. Descript. de l'Afrique, lib. i. p. 51.

The usual manner of trying their swiftness is by hunting the ostrich. The horse is the only animal whose speed is comparable to that of this creature, which is found in the sandy plains, with which those countries abound. The instant the ostrich perceives itself aimed at, it makes to the mountains, while the horseman pursues with all the swiftness possible, and endeavours to cut off its retreat. The chase then continues along the plain, while the ostrich makes use of both legs and wings to assist its motion. However, a horse of the first speed is able to outrun it; so that the poor animal is then obliged to have recourse to art to elude the hunter, by frequently turning: at length, finding all escape hopeless, it hides its head wherever it can, and suffers itself tamely to be taken. If the horse, in a trial of this kind, shows great speed, and is not readily tired, his price becomes proportionably great, and there are some horses valued at a thousand ducats

But the horses thus caught, or trained in this manner, are at present but very few; the value of Arabian horses, over all the world, has, in a great measure, thinned the deserts of the wild breed; and there are very few to be found in those countries, except such as are tame. The Arabians, as we are told by historians, first began the management of horses in the time of Sheque Ismael. Before that, they wandered wild along the face of the country, neglected and useless; but the natives then first began to tame their fierceness, and to improve their beauty; so that at present they possess a race of the most beautiful horses in the world, with which they drive a trade, and furnish the stables of princes at immense prices.

There is scarce an Arabian, how poor soever, but is provided with his horse.* They, in general, make use of mares in their ordinary excursions; experience having taught them that they support fatigue thirst, and hunger, better than the horses are found to do. They are also less vicious, of a gentler nature, and are not so apt to neigh. They are more harmless also among themselves, not so apt to kick or hurt each other, but remain all day together without the least mischief. The Turks, on the contrary, are not fond of mares; and the Arabians sell them such horses as they do not choose to keep for stallions at home. They preserve the pedigree of their horses with great care, and for several ages back. They know their alliances and all their genealogy; they distinguish the races by different names, and divide them into three classes. The first is that of the nobles, the ancient breed, and unadulterated on either side: the second is that of the horses of the ancient race, but adulterated; and the third is that of the common and inferior kind: the last they sell at a low price; but those of the first class, and even of the second, amongst which are found horses of equal value to the former, are sold extremely dear. They know, by long experience, the race of a horse by his appearance; they can tell the name, the surname, the colour, and the marks properly belonging to each. When they are not possessed of stallions of the noble race themselves, for their mares, they borrow from their neighbours, paying a proper price as with us, and receive a written attestation of the whole. In this attestation is contained the name of the horse and the mare, and their respective genealogies. When the mare has produced her foal, new witnesses are called, and a new attestation signed, in which are described the marks of the foal, and the day noted when it was brought forth. These attestations increase the value of the horse; and they are given to the person who buys him. The most ordinary mare of this race sells for five hundred crowns; there are many that sell for a thousand; and some of the very finest kinds for fourteen or fifteen hundred pounds. As the Arabians have no other house but a tent to live in, this also serves them for a stable; so that the mare, the foal, the husband, the wife, and the children, lie altogether indiscriminately; the little children are often seen upon the body, or the neck of the mare, while these continue inoffensive and harmless, permitting them thus to play with and caress them without any injury. The Arabians never beat their horses: they treat them gently; they speak to them, and seem to hold a discourse; they use them as friends; they never attempt to increase their speed by the whip, nor spur them but in cases of necessity. However, when this happens, they set off with amazing swiftness; they leap over obstacles with as much agility as a buck; and if the rider happens to fall, they are so manageable that they stand still in the midst of their most rapid career. The Arabian horses are of a middle size, easy in their motions, and rather inclined to leanness than fat. They are regularly dressed every morning and evening, and with such care that the smallest roughness is not left upon their skins. They wash the legs, the mane, and the tail, which they never cut; and which they seldom comb, lest they should thin the hair. They give them nothing to eat during the day; they only give them to drink once or twice; and at sun-set they hang a bag to their heads, in which there is about half a bushel of clean barley. They continue eating the whole night, and the bag is taken away the next morning. They are turned out to pasture in the beginning of March, when the grass is pretty high, and at which time the mares are given to the stallion. When the spring is past, they take them again from pasture, and they get neither grass nor hay during the rest of the year; barley is their only food, except now and then a little straw. The mane of the foal is always clipped when about a year or eighteen months old, in order to make it stronger and thicker. They begin to break them at two years old, or two years and a half at farthest; they never saddle or bridle them till at that age; and then they are always kept ready saddled at the door of the tent, from morning till sun-set, in order to be prepared against any surprise. They at present seem sensible of the great advantage their horses are to the country; there is a law, therefore, that prohibits the exportation of the mares, and such stallions as are brought into England are generally purchased on the Eastern shores of Africa, and come round to us by the Cape of Good Hope. They are in general less in stature than our own, being not above fourteen, or fourteen hands and a half high; their motions are much more graceful and swifter than our own horses; but nevertheless, their speed is far from being equal; they run higher from the ground; their stroke is not so long and close; and they are far inferior in bottom. Still, however, they must be considered as the first and finest breed in the world; and that from which all others have derived their principal qualifications. It is even probable that Arabia is the original country of horses; since there, instead of crossing the breed, they take every precaution to keep it entire. In other countries they must continually change the races, or their horses would soon degenerate; but there the same blood has past down through a long succession, without any diminution either of force or beauty.

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* Buffon.

The race of Arabian horses has spread itself into Barbary, among the Moors, and has even extended across that extensive continent to the Western shores of Africa. Among the Negroes of Gambia and Senegal, the chiefs of the country are possessed of horses, which, though little, are very beautiful, and extremely manageable. Instead of barley, they are fed in those countries with maize, bruised and reduced into meal, and mixed up with milk when they design to fatten them. These are considered as next to the Arabian horses, both for swiftness and beauty; but they are rather still smaller than the former. The Italians have a peculiar sport, in which horses of this breed run against each other. They have no riders, but saddles so formed as to flap against the horses' sides as they move, and thus to spur them forward. They are set to run in a kind of railed walk, about a mile long, out of which they never attempt to escape; but, when they once set forward, they never stop, although the walk from one end to the other is covered with a crowd of spectators, which opens and gives way as the horses approach. Our horses would scarcely, in this manner, face a crowd, and continue their speed, without a rider, through the midst of a multitude; and, indeed, it is a little surprising how in such a place the horses find their own way. However, what our English horses may want in sagacity, they make up by their swiftness; and it has been found upon computation, that their speed is nearly one fourth greater, even carrying a rider, than that of the swiftest Barb without one.

The Arabian breed has been diffused into Egypt as well as Barbary, and into Persia also; where, as we are told by Marcus Paulus, there are studs of ten thousand white mares all together, very fleet, and with the hoof so hard that shoeing is unnecessary. In these countries, they in general give their horses the same treatment that they give in Arabia, except that they litter them upon a bed of their own dung, dried in the sun, and then reduced to powder. When this, which is spread under the horse about five inches thick, is moistened, they dry it again, and spread it as before. The horses of these countries a good deal resemble each other. They are usually of a slender make; their legs fine, bony, and far apart; a thin mane; a fine crest; a beautiful head; the ears small and well pointed; the shoulder thin; the side rounded, without any unsightly prominence; the croup is a little of the longest, and the tail is generally set high. The race of horses, however, is much degenerated in Numidia; the natives having been discouraged from keeping the breed up by the Turks, who seize upon all the good horses, without paying the owners the smallest gratuity for their care in bringing them up. The Tingitanians and Egyptians have now, therefore, the fame of rearing the finest horses, both for size and beauty. The smallest of these last are usually sixteen hands high; and all of them shaped, as they express it, with the elegance of an antelope

Next to the Barb, travellers generally rank the Spanish genette

These horses, like the former, are little, but extremely swift and beautiful. The head is something of the largest; the mane thick; the ears long, but well pointed; the eyes filled with fire; the shoulder thickish, and the breast full and large. The croup round and large; the legs beautiful, and without hair; the pastern a little of the longest, as in the Barb, and the hoof rather too high. Nevertheless, they move with great ease, and carry themselves extremely well. Their most usual colour is black, or a dark bay. They seldom or never have white legs, or white snip. The Spaniards, who have a groundless aversion to these marks, never breed from such as have them. They are all branded on the buttock with the owner's name; and those of the province of Andalusia pass for the best. These are said to possess courage, obedience, grace, and spirit, in a greater degree than even the Barb; and, for this reason, they have been preferred as war-horses to those of any other country.

The Italian horses were once more beautiful than they are at present, for they have greatly neglected the breed. Nevertheless, there are still found some beautiful horses among them, particularly among the Neapolitans, who chiefly use them for the draught. In general, they have large heads and thick necks. They are also restive, and consequently unmanageable. These faults, however, are recompensed by the largeness of their size, by their spirit, and the beauty of their motion. They are excellent for show, and have a peculiar aptitude to prance.

The Danish horses are of such an excellent size and so strong a make, that they are preferred to all others for the draught. There are some of them perfectly well shaped; but this is but seldom seen, for in general they are found to have a thick neck, heavy shoulders, long and hollow back, and a narrow croup: however, they all move well, and are found excellent both for parade and war. They are of all colours, and often of whimsical ones, some being streaked like the tiger, or mottled like the leopard.

The German horses are originally from Arabian and Barbary stocks; nevertheless, they appear to be small and ill-shaped: it is said also, that they are weak and washy, with tender hoofs. The Hungarian horses, on the other hand, are excellent for the draught, as well as the saddle. The Hussars, who use them in war, usually slit their nostrils; which is done, as it is said, to prevent their neighing, but, perhaps, without any real foundation.

The Dutch breed is good for the draught, and is generally used for that purpose over Europe: the best come from the province of Friezland. The Flanders horses are much inferior to the former; they have most commonly large heads, flat feet, and swollen legs; which are an essential blemish in horses of this kind.

The French horses are of various kinds; but they have few that are good. The best horses of that country come from Limosin; they have a strong resemblance to the Barb, and, like them, are excellent for the chase but they are slow in coming to perfection: they are to be carefully treated while young, and must not be backed till they are eight years old. Normandy furnishes the next best; which, though not so good for the chase, are yet better for war. In general, the French horses have the fault of being heavy shouldered, which is opposite to the fault of the Barb, which is too thin in the shoulder, and is, consequently, apt to be shoulder-slipt.

Having mentioned the horses most usually known in Europe, we pass on to those of more distant countries, of whose horses we can only judge by report. We mentioned the wild horses of America. Such as are tame, if we may credit the latest reports,* are admirable. Great numbers of these are bred up to the chase, and are chiefly kept for this purpose, particularly at Quito. The hunters, as Ulloa informs us, are divided into two classes; one part on foot, the other on horseback the business of the footmen is to rouse the deer; and that of the horsemen to hunt it down. They all, at break of day, repair to the place appointed, which is generally on the summit of a hill, with every man his greyhound. The horsemen place themselves on the highest peaks; whilst those on foot range the precipices, making a hideous noise, in order to start the deer. Thus the company extend themselves three or four leagues, or more, according to their numbers. On starting any game, the horse which first perceives it, sets off, and the rider, being unable to guide or stop him, pursues the chase, sometimes down such a steep slope, that a man on foot, with the greatest care could hardly keep his legs; from thence he flies up a dangerous ascent, or along the side of a mountain; so that a person not used to this exercise, would think it much safer to throw himself out of the saddle, than commit his life to the precipitate ardour of his horse. The other horses, which join in the chase, do not wait for the riders to animate them; they set forward immediately upon seeing another at full speed; and it becomes prudent in the rider to give them their way, and at the same time to let them feel the spur, to carry him over the precipices. These horses are backed and exercised to this method of hunting; and their usual pace is trotting.

There are said to be very good horses in the islands of the Archipelago. Those of Crete were in great reputation among the ancients, for their swiftness and force; however, at present they are but little used, even in the country itself, because of the unevenness of the ground, which is there very rocky and mountainous. The original horses of Morocco are much smaller than the Arabian breed; however, they are very swift and vigorous. In Turkey there are to be found horses of almost all races: Arabians, Tartars, Hungarians, and those natural to the place. The latter are very beautiful and elegant; they have a great deal of fire, swiftness, and management; but they are not able to support fatigue: they eat little; they are easily heated; and they have skins so sensible, that they can scarcely bear the rubbing of the stirrup. The Persian horses are, in general, the most beautiful and most valuable of all the east. The pastures in the plains of Media, Persepolis, Ardebil, and Derbent, are excellent for the purpose of rearing them; and there were bred in those places vast numbers, by order of the government of Persia, while that country was under any government. Pietro della Valle prefers the horses of Persia to those of Italy; and informs us, that they are in general of a middle size; and although some are found even of the smallest stature, yet that does not impair their beauty or their strength: yet, in some places, they are found of a very good size, and as large as the English saddle-horses are generally found to be: they have all a thin head, a fine crest, a narrow breast, small ears well placed, the legs fine, the hoof hard, and the croup beautiful; they are docile, spirited, nimble, hardy, courageous, and capable of supporting a very great fatigue; they run very swiftly, without being easily fatigued; they are strong and easy, being only supplied with barley and chopped straw; they are put to grass only for six weeks in the spring; they have always the tail at full length, and there is no such thing as geldings among the number; they are defended from the air, as in England, by body-clothes; they attend them with the most punctual exactness; and they are rid generally in a snaffle, without spurs. Great numbers of these are every year transported into Turkey, but chiefly into the East-Indies: however, after all, travellers agree that they are not to be compared to the Arabian horses, either for courage, force, or beauty; and that the latter are eagerly sought, even in Persia.

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* Ulloa's Voyage, vol. i. p. 464.

The horses of India are of a very indifferent kind, being weak and washy. Those which are used by the grandees of the country, come from Persia and Arabia; they are fed with a small quantity of hay during the day; and at night they have boiled peas, mixed with sugar and butter, instead of oats or barley: this nourishment supports them, and gives them strength; otherwise, they would soon sink and degenerate. Those naturally belonging to the country, are very small and vicious. Some are so very little, that Taverner reports, that the young Mogul prince, at the age of seven or eight, rode one of those little horses, that was not much larger than a greyhound: and it is not long since one of these was brought over into this country, as a present to the Queen, that measures no more than nine hands high; and is not much larger than a common mastiff. It would seem, that climates excessively hot, are unfavourable to this animal. In this manner, the horses of the Gold-coast, and of Guinea, are extremely little, but very manageable. It is a common exercise with the grandees of that country, who are excellent horsemen, to dart out their lances before them upon full gallop, and to catch them again before they come to the ground. They have a sport also on horseback, that requires great dexterity in the rider, and a great share of activity in the horse: they strike off a ball, with a battle-dore, while they are upon a full gallop, and pursuing it, strike it again before it comes to the ground; and this they continue for a mile together, striking sometimes to the right, and sometimes to the left, with amazing speed and agility.

The horses of China are as indifferent as those of India: they are weak, little, ill-shaped, and cowardly. Those of Corea are not above three feet high: almost all the breed there are made geldings, and are so timorous, that they can be rendered no way serviceable in war · so that it may be said, that the Tartar horses were properly the conquerors of China. These, indeed, are very serviceable in war, and although but of a middle size, yet they are surprisingly patient, vigorous, swift, and bold; their hoofs are extremely hard, though rather too narrow; their heads are fine, but rather too little; the neck is long and stiff; the legs of the longest; and yet, with all these faults, they are found to be an excellent breed. The Tartars live with their horses pretty much in the same manner as the Arabians do; they begin to back them at the age of seven or eight months, placing their children upon them, who manage them even at that early age. By these means they break them by little and little, till at last, about the age of six or seven years, they are capable of enduring amazing hardships. Thus they have been known to march two or three days without once stopping; to continue five or six, without eating any thing except a handful of grass at every eight hours; and, besides, to remain without drinking for four and twenty hours. These horses, which are so vigorous in their own country, lose all their strength when they are brought into China or the Indies; but they thrive pretty well in Persia and Turkey. The race of little Tartars towards the north, have also a breed of little horses, which they set such a value upon, that it is forbidden to sell them to strangers: these horses have the very same qualities with those of the larger kind; which they probably derive from a similar treatment. There are also very fine horses in Circassia and Mingrelia. There are some greatly esteemed in the Ukraine, in Walachia, Poland, and Sweden; but we have no particular accounts of their excellencies or defects.

If we consult the ancients on the nature and qualities of the horses of different countries, we learn, that the Grecian horses, and particularly those of Thessaly, had the reputation of being excellent for war; that those of Achaia were the largest that were known; that the most beautiful came from Egypt, which bred great numbers; that the horses of Ethiopia were not in esteem, from the heat of the country; that Arabia and Africa furnished very beautiful horses, and very fit for the course; that those of Italy, and particularly of Apulia, were very good; that in Sicily, Cappadocia, Syria, Armenia, Media, and Persia, there were excellent horses, equally esteemed for their speed and vigour; that those of Sardinia and Corsica, though small, were spirited and courageous; that those of Spain resembled the Parthian horses, in being very well adapted for war; that in Walachia and Transylvania, there were horses with bushy tails, and manes hanging down to the ground, which, nevertheless, were extremely swift and active; that the Danisn horses were good leapers; those of Scandinavia, though little, were well shaped, and possessed of great agility; that the Flanders breed was strong; that the Gaulish horses were good for carrying burdens; that the German breeds were so bad, so diminutive, and ill-shaped, that no use could be made of them; that the Swiss and Hungarian horses were good; and, lastly, that those of India were very diminutive and feeble.

Such are the different accounts we have of the various races of horses in different parts of the world. I have hitherto omitted making mention of one particular breed, more excellent than any that either the ancients or moderns have produced; and that is our own. It is not without great assiduity, and unceasing application, that the English horses are now become superior to those of any other part of the world, for size, strength, swiftness, and beauty. It was not without great attention, and repeated trials of all the best horses in different parts of the world, that we have been thus successful in improving the breed of this animal; so that the English horses are now capable of performing what no others could ever attain to. By a judicious mixture of the several kinds, by the happy difference of our soils, and by our superior skill in management, we have brought this animal to its highest perfection. An English horse, therefore, is now known to excel the Arabian in size and swiftness, to be more durable than the Barb, and more hardy than the Persian. An ordinary racer is known to go at the rate of a mile in two minutes: and we had one instance, in the admirable Childers, of still greater rapidity. He has been frequently known to move above eighty-two feet and a half in a second, or almost a mile in a minute: he has run also round the course of Newmarket, which is very little less than four miles, in six minutes and forty seconds. But what is surprising, few horses have been since found that ever could equal him; and those of his breed have been remarkably deficient.

However this be, no horses can any way equal our own, either in point of swiftness or strength; and these are the qualifications our horsemen seem chiefly to value. For this reason, when the French, or other foreigners, describe our breed, they all mention, as a fault, the awkward and ungainly motion of our horses; they allow them to be very good indeed, but they will not grant them an easy or an elegant carriage.* But these writers do not consider that this seeming want of grace is entirely the result of our manner of breaking them. We consult only speed and dispatch in this animal's motions: the French and other nations, are more anxious for parade and spirit. For this reason, we always throw our horses forward, while they put them upon their haunches; we give them an easy swift gait of going, that covers a great deal of ground; they, on the contrary, throw them back, giving them a more showy appearance indeed, but one infinitely less useful. The fault of our manner of breaking is, that the horse is sometimes apt to fall forward; the French managed horse never falls before, but more usually on one side; and for this reason, the rider wears stiff boots, to guard his legs against such accidents. However, it would be a very easy matter to give our horses all that grace which foreigners are so fond of; but it would certainly take from their swiftness and durability.

But in what degree of contempt soever foreigners might formerly have held our horses, they have for some time perceived their error, and our English hunters are considered as the noblest and the most useful horses in the world. Our geldings are, therefore, sent over to the continent in great numbers, and sell at very great prices; as for our mares and stallions, there is a law prohibiting their exportation; and one similar to this, is said to have obtained even as early as the times of Athelstan, who prohibited their exportation, except where designed as presents.

Roger de Belegme, created Earl of Shrewsbury by William the Conqueror,† is the first who is recorded to have made attempts towards the mending our native breed. He introduced Spanish stallions into his estate at Powisland in Wales, from which that part of the country was for many ages after famous for a swift and generous race of horses. however, at that time strength and swiftness were more regarded than beauty; the horses' shapes, in time of action, being entirely hid by a coat of armour, which the knights then usually put upon them, either by way of ornament or defence.

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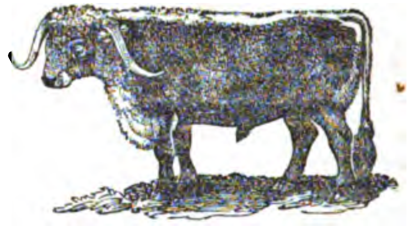
* See Buffon's Account of our Horses.

† British Zoology, vol. i. p. 4. To this work I am indebted for several particulars with regard to the native animals of this island

The number of our horses in London alone, in the time of King Stephen, is said to have amounted to twenty thousand. However, long after, in the times of Queen Elizabeth, the whole kingdom could not supply two thousand horses to form our cavalry. At present, the former numbers seem revived; so that in the late war, we furnished out above thirteen thousand horsemen; and could, if hard pushed, supply above four times that number. How far this great increase of horses among us may be beneficial, or otherwise, is not the proper business of the present page to discuss; but certain it is, that where horses increase in too great a degree, men must diminish proportionably; as that food which goes to supply the one, might very easily be converted into nourishment to serve the other. But, perhaps, it may be speculating too remotely, to argue for the diminution of their numbers upon this principle, since every manufacture we export into other countries, takes up room, and may have occupied that place, which, in a state of greater simplicity, might have given birth and subsistence to mankind, and have added to population.

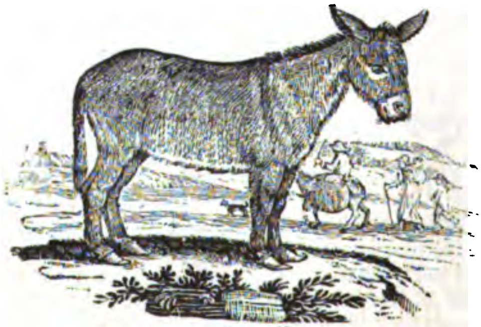
Be this as it will, as we have been at such expense and trouble to procure an excellent breed of horses, it is not now to be expected that we should decline the advantages arising from it, just when in our possession. It may be, therefore, the most prudent measure in our Legislature, to encourage the breed as a useful branch of commerce, and a natural defence to the country. But how far this end is answered by the breeding up of racers, is what most persons, versed in this subject, are very apt to question. They assert, that the running-horse, as the breed has been for a long time refined, is unfit for any other service than that of the course, being too slight either for the road, the chase, or the combat, and his joints so delicately united, as to render him subject to the smallest accidents. They, therefore, conclude, that less encouragement given to racing, would be a means of turning us from breeding rather for swiftness than strength; and that we should thus be again famous for our strong hunters, which, they say, are wearing out from among us.

How far this may be fact, I will not take upon me to determine, being but little versed in a subject that does not properly come within the compass of natural history. Instead, therefore, of farther expatiating on this well-known animal's qualifications, upon which many volumes might easily be written, I will content myself with just mentioning the description of Camerarius, in which he professes to unite all the perfections which a horse ought to be possessed of;—"It must," says he, "have three parts like those of a woman; the breast must be broad, the hips round, and the mane long: it must in three things resemble a lion; its countenance must be fierce, its courage must be great, and its fury irresistible: it must have three things belonging to the sheep; the nose, gentleness, and patience: it must have three of a deer: head, leg, and skin: it must have three of a wolf; throat, neck,



Ox, p. 20.

Bull, p. 39.



Ass, p. 17.

To face p. 17, vol ii

and hearing: it must have three of a fox; ear, tail, and trot: three of a serpent; memory, sight, and flexibility: and, lastly, three of a hare running, walking, and perseverance."

CHAPTER II.

OF THE ASS.*

Although this animal is very easily distinguished from the horse at first sight, yet, upon closer inspection, the similitude between them is very striking. They have both a similar outline in the external parts; the same conformation within. One would be led, from the great resemblance there is between them, to suppose them of the same species; and that the ass was only a horse degenerated: however, they are perfectly distinct, and there is an inseparable line drawn between them, for the mule they produce is barren. This seems to be the barrier between every species of animals; this keeps them asunder, and preserves the unities of their form. If the mule, or the monster, bred between two animals, whose form nearly approaches, is no longer fertile, we may then conclude, that these animals, however resembling, are of different kinds. Nature has providently stopped the fruitfulness of these ill-formed productions, in order to preserve the form of every animal uncontaminated; were it not for this, the races would quickly be mixed with each other; no one kind would preserve its original perfection; every creature would quickly degenerate; and the world would be stocked with imperfection and deformity.

The horse and the ass, therefore, though so nearly approaching in form, are of two distinct kinds, different in their natures; and were there but one of each kind, both races would then be extinguished Their shapes and their habits may, indeed, be very nearly alike: but there is something in every animal, besides its conformation or way of life, that determines its specific nature. Thus there is much greater resemblance between the horse and the ass, than between the sheep and the goat; and yet the latter produce an animal that is by no means barren, but which quickly re-produces an offspring resembling the sheep; while the mule of the former is marked with certain sterility. The goat and the sheep may be therefore said to be of one kind, although so much unlike in figure; while the horse and the ass are perfectly distinct, though so closely resembling. It has, indeed, been said by Aristotle, that their male is sometimes prolific; this, however, has not been confirmed by any other testimony, although there has elapsed a period of near two thousand years to collect the evidence.

But what tends to put the subject out of dispute is, that the two animals are found in a state of nature entirely different. The onager, or wild ass, is seen in still greater abundance than the wild horse; and the peculiarities of its kind are more distinctly marked than in those of the tame one. Had it been a horse degenerated, the likeness would be stronger between them, the higher we went to the original stock from whence both have been supposed to be sprung. The wild animals of both kinds would, in such a case, resemble each other, much more than those of the tame kind, upon whom Art has, for a succession of ages, been exercising all its force, and producing strange habits and new alterations. The contrary, however, obtains, and the wild ass is even more assinine, if I may so express it, than that bred in a state of domestic servitude; and has even a natural aversion to the horse, as the reader will shortly learn.

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* Many parts of this account are extracted from Daubenton and Buffon; which I mention here, to avoid troubling the reader with a multiplicity of quotations.

The wild ass has, by some writers, been confounded with the zebra, but very improperly, for they are of a very different species. The wild ass is not streaked like the zebra, nor is his shape so beautiful: his figure is pretty much the same as that of the common ass, except that he is of a brighter colour, and has a white list running from his head to his tail. This animal is found wild in many islands of the Archipelago, particularly in that of Cerigo. There are many wild asses in the deserts of Lybia and Numidia, that run with such amazing swiftness, that scarce even the coursers of the country can overtake them. When they see a man, they set up a horrid braying, and stop short all together, till he approaches near them; they then, as if by common consent, fly off with great speed; and it is upon such occasions that they generally fall into the traps which are previously prepared to catch them. The natives take them chiefly upon account of their flesh, which they esteem as delicious eating; and for their skins, of which that kind of leather is made which is called *shagreen*.

Olearius relates that the monarch of Persia invited him on a certain day to be present at an entertainment of a very peculiar nature, which was exhibited in a small building, near the palace, resembling a theatre. After a collation of fruits and sweetmeats, more than thirty of these wild asses were driven into the area, among which the monarch discharged several shot, and some arrows, and in which he was imitated by some of the rest of his attendants. The asses, finding themselves wounded, and no way of escaping, instantly began to attack each other, biting with great fierceness, and braying terribly. In this manner they continued their mutual animosity, while the arrows were poured in from above, until they were all killed; upon which they were ordered to be taken, and sent to the king's kitchen at Ispahan. The Persians esteem the flesh of this animal so highly, that its delicacy has even become a proverb among them. What may be the taste of the wild ass's flesh, we are unable to say; but certain it is, that the flesh of the tame ass is the worst that can be obtained, being dryer, more tough, and more disagreeable than horse flesh. Galen even says that it is very unwholesome. Yet we should not judge hastily upon the different tastes of different people, in the preference they give to certain meats. The climate produces very great changes in the tenderness and the savour of several viands; that beef, for instance, which is so juicy and good in England, is extremely tough and dry when killed under the line: on the contrary, that pork, which is with us so unpalatable in summer, in the warmer latitudes, where it is always hotter than here, is the finest eating they have, and much preferable to any hog's flesh in Europe.

The ass, like the horse, was originally imported into America by the

Spaniards, and afterwards by other nations. That country seems to have been peculiarly favourable to this race of animals; and where they have run wild, they have multiplied in such numbers, that in some places they are become a nuisance.* In the kingdom of Quito, the owners of the grounds where they are bred, suffer all persons to take away as many as they can, on paying a small acknowledgment, in proportion to the number of days their sport lasts. They catch them in the following manner. A number of persons go on horseback, and are attended by Indians on foot: when arrived at the proper places, they form a circle in order to drive them into some valley; where, at full speed, they throw the noose, and endeavour to halter them. Those creatures finding themselves enclosed, make very furious efforts to escape; and, if only one forces his way through, they all follow with an irresistible impetuosity. However, when noosed, the hunters throw them down and secure them with fetters, and thus leave them till the chase is over. Then, in order to bring them away with greater facility, they pair them with tame beasts of the same kind; but this is not easily performed, for they are so remarkably fierce that they often hurt the persons who undertake to manage them. They have all the swiftness of horses, and neither declivities nor precipices can retard their career. When attacked, they defend themselves with their heels and mouth with such activity, that, without slackening their pace, they often maim their pursuers. But the most remarkable property in these creatures is, that after carrying their first load, their celerity leaves them, their dangerous ferocity is lost, and they soon contract the stupid look and dulness peculiar to the assinine species. It is also observable, that these creatures will not permit a horse to live among them. They always feed together; and, if a horse happens to stray into the place where they graze, thy all fall upon him; and, without giving him the liberty of flying, they bite and kick him till they leave him dead upon the spot.

Such is the animal in its natural state, swift, fierce, and formidable; but, in this state of tameness, the ass presents a very different picture; the moment his native liberty is repressed, he seems entirely to give up all claims to freedom; and he assumes a patience and submission even humbler than his situation. He is, in a state of tameness, the most gentle and quiet of all animals. He suffers with constancy, and perhaps, with courage, all the ill-treatment that cruelty and caprice are pleased to inflict. He is temperate with regard to the quantity and the quality of his provision. He is contented with the most neglected weeds; and makes his humble repast upon what the horse and other animals leave behind. If he gives the preference to any vegetable, it is to the plantain; for which he is often seen to neglect every other herb in the pasture: but he is chiefly delicate with respect to his water: he drinks only at the clearest brooks, and chiefly those to which he has been accustomed. He drinks as soberly as he eats; and never, like the horse, dips his nose into the stream. As he is seldom saddled, he frequently rolls himself upon the grass; and lies down, for this purpose, as often as he has an opportunity, without minding what becomes of his burden He never rolls, like the horse, in the mud; he even fears to wet his feet; and turns out of his way to avoid the dirty parts of a road.

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* Ulloa, vol. i. p. 316.

When very young, the ass is sprightly, and even tolerably handsome; but he soon loses these qualifications, either by age or bad treatment, and he becomes slow, stupid, and headstrong. He seems to show no ardour, except for the female, having been often known to die after the covering. The she-ass is not less fond of her young than the male is of her; and we are assured that she will cross fire and water to protect, or rejoin it. This animal is sometimes not less attached to his owner, by whom he is too often abused. He scents him at a distance, and distinguishes him from others in a crowd; he knows the ways he has passed, and the places where he inhabits.

When overloaded, the ass shows the injustice of his master, by hanging down his head and lowering his ears; when he is too hard pressed, he opens his mouth and draws back his lips in a very disagreeable manner. If his eyes are covered, he will not stir a step; and, if he is laid down in such a manner, that one eye is covered with the grass while the other is hidden with a stone, or whatever is next at hand, he will continue fixed in the same situation, and will not so much as attempt to rise to free himself from those slight impediments. He walks, trots, and gallops like a horse; but, although he sets out very freely at first, yet he is soon tired; and then no beating will make him mend his pace. It is in vain that his unmerciful rider exerts his whip or his cudgel; the poor little animal bears it all with patience, and without a groan; and, conscious of his own imbecility, does not offer even to move.

Notwithstanding the stupid heaviness of his air, he may be educated with as much ease as any other animal; and several have been brought up to perform, and exhibited as a show. In general, however, the poor animal is entirely neglected. Man despises this humble, useful creature, whose efforts are exerted to please him, and whose services are too cheaply purchased. The horse is the only favourite, and upon him alone all expense and labour are bestowed. He is fed, attended, and stabled, while the ass is abandoned to the cruelty of the lowest rustics, or even to the sport of children, and, instead of gaining by the lessons he receives, is always a loser. He is conducted along by blows; he is insulted by unnecessary stripes; he is overloaded by the lazy; and, being generally the property of the poor, he shares with them in their wants and their distresses. Thus, this faithful animal, which, were there no horses, would be the first of the quadruped kind in our esteem, is now considered as nothing; his properties and qualifications being found in a higher degree elsewhere, he is entirely disregarded; and, from being the second, he is degraded into one of the most useless of the domestic quadrupeds.

For this reason, very little care has been taken to improve the breed; it is suffered to degenerate; and it is probable, that of all other animals this alone is rendered feebler and more diminutive, by being in a state of domestic servitude. The horse, the cow, and the sheep, are rendered larger by the assiduity of man; the ass is suffered to dwindle every generation, and particularly in England, where it is probable that, but for the medicinal qualities of its milk, the whole species would have ere now been extinguished. Nevertheless we have good reason to believe that, were the same care bestowed on the ass that is spent upon the horse, were the same industry used in crossing the breed and improving it, we should see the ass become from his present mean state, a very portly and serviceable animal; we should find him rival the horse in some of his perfections, and exceed him in others. The ass, bulk to bulk, is stronger than the horse; is more sure-footed; and, though more slow in his motions, he is much less apt to start out of the way.

The Spaniards, of all people in Europe, seem alone to be acquainted with the value of the ass. They take all proper precautions to improve the breed; and I have seen a jack-ass, from that country, above fifteen hands high. This animal, however, seems originally a native of Arabia. A warm climate is known to produce the largest and the best; their size and spirit decline in proportion as they advance into colder regions.

Though now so common in all parts of England, the ass was entirely lost among us during the reign of Queen Elizabeth. Holingshed informs us that our land did yield no asses.* However, there are accounts of their being common in England before that time. In Sweden, they are at present a sort of rarity; nor does it appear by the last history of Norway, that they have yet reached that country. It is in the hotter climates alone that we are to look for the original of this serviceable creature. In Guinea, they are larger and more beautiful than even the horses of the same country. In Persia, they have two kinds; one of which is used for burdens, being slow and heavy; the other, which is kept for the saddle, being smooth, stately, and nimble. They are managed as horses, only that the rider sits nearer the crupper, and they are taught to amble like them. They generally cleave their nostrils to give them more room for breathing, and many of these are sold for forty or fifty pounds.

The ass is a much more hardy animal than the horse, and liable to fewer diseases. Of all animals covered with hair, he is the least subject to vermin, for he has no lice, probably owing to the dryness and the hardness of his skin. Like the horse, he is three or four years in coming to perfection; he lives till twenty to twenty-five; sleeps much less than the horse; and never lies down for that purpose, unless very much tired. The she-ass goes above eleven months with young, and never brings forth more than one at a time. The mule may be engendered either between a horse and a she-ass, or between a jack-ass and a mare. The latter breed is every way preferable, being larger, stronger, and better shaped. It is not yet well known whether the animal called the Gimerro be one of these kinds; or, as is asserted, bred between the ass and the bull. While naturalists affirm the impossibility of this mixture, the natives of the Alpine countries, where this animal is bred, as strongly insist upon its reality. The common mule is very healthy, and will live above thirty years, being found very serviceable in carrying burdens, particularly in mountainous and stony places. where horses are not so sure-footed. The size and strength of our asses is at present greatly improved by the importation of Spanish jack-asses; and it is probable we may come in time to equal the Spaniards in breeding them, where it is not uncommon to give fifty or sixty guineas for a mule; and, indeed, in some mountainous countries, the inhabitants cannot well do without them. Their manner of going down the precipices of the Alps, or the Andes, is very extraordinary; and with it I will conclude their history. In these passages, on one side, are steep eminences, and, on the other, frightful abysses; and, as they generally follow the direction of the mountain, the road, instead of lying in a level, forms at every little distance steep declivities, of several hundred yards downward. These can only be descended by mules; and the animal itself seems sensible of the danger, and the caution that is to be used in such descents. When they come to the edge of one of these descents, they stop, without being checked by the rider; and, if he inadvertently attempts to spur them on, they continue immoveable. They seem all this time ruminating on the danger that lies before them, and preparing themselves for the encounter. They not only attentively view the road, but tremble and snort at the danger. Having prepared for the descent, they place their fore-feet in a posture, as if they were stopping themselves; they then also put their hinder-feet together, but a little forward, as if they were going to lie down. In this attitude, having taken as it were a survey of the road, they slide down with the swiftness of a meteor. In the mean time, all the rider has to do is to keep himself fast on the saddle, without checking the rein, for the least motion is sufficient to disorder the equilibrium of the mule; in which case they both unavoidably perish. But their address, in this rapid descent, is truly wonderful; for, in their swiftest motion, when they seem to have lost all government of themselves, they follow exactly the different windings of the road, as if they had previously settled in their minds the route they were to follow, and taken every precaution for their safety. In this journey, the natives, who are placed along the sides of the mountains, and hold by the roots of the trees, animate the beasts with shouts, and encourage them to perseverance. Some mules, after being long used to these journeys, acquire a kind of reputation for their safety and skill; and their value rises in proportion to their fame.*

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* British Zoology, vol. i. p. 11

CHAPTER III.

OF THE ZEBRA.

THERE are but three animals of the horse kind. The horse, which is the most stately and courageous; the ass, which is the most patient and humble; and the zebra, which is the most beautiful, but at the same time the wildest animal in Nature. Nothing can exceed the delicate regularity of this creature's colour, or the lustrous smoothness of its skin; but, on the other hand, nothing can be more timid or more untameable.

It is chiefly a native of the southern parts of Africa; and there are whole herds of them often seen feeding in those extensive plains that ie towards the Cape of Good Hope. However, their watchfulness is such, that they will suffer nothing to come near them, and their swiftness so great, that they readily leave every pursuer far behind. The zebra, in shape, rather resembles the mule, than the horse or the ass. It is rather less than the former, and yet larger than the latter. Its ears are not so long as those of the ass, and yet not so small as in the horse-kind. Like the ass, its head is large, its back straight, its legs finely placed, and its tail tufted at the end; like the horse, its skin is smooth and close, and its hind quarters round and fleshy. But its greatest beauty lies in the amazing regularity and elegance of its colours. In the male, they are white and brown; in the female, white and black. These colours are disposed in alternate stripes over the whole body, and with such exactness and symmetry, that one would think Nature had employed the rule and compass to paint them. These stripes, which, like so many ribands, are laid all over its body, are narrow, parallel, and exactly separated from each other. It is not here, as in other party-coloured animals, where the tints are blended into each other; every stripe here is perfectly distinct, and preserves its colour round the body, or the limb, without any diminution. In this manner are the head, the body, the thighs, the legs, and even the tail and the ears beautifully streaked, so that at a little distance one would be apt to suppose that the animal was dressed out by Art, and not thus admirably adorned by Nature.

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* Ulloa, vol. i.

In the male zebra, the head is striped with fine bands of black and white, which in a manner centre in the forehead. The ears are variegated with a white and dusky brown. The neck has broad stripes of the same dark brown running round it, leaving narrow white stripes between. The body is striped also across the back with broad bands, leaving narrow spaces of white between them, and ending in points at the sides of the belly, which is white, except a black line pectinated on each side, reaching from between the fore legs, along the middle of the belly, two thirds of its length. There is a line of separation between the trunk of the body and the hinder quarters, on each side; behind which, on the rump, is a plat of narrow stripes, joined together by a stripe down the middle, to the end of the tail. The colours are different in the female; and in none the stripes seem entirely to agree in form, but in all they are equally distinct; the hair equally smooth and fine; the white shining and unmixed; and the black, or brown, thick and lustrous.

Such is the beauty of this creature, that it seems by Nature fitted to satisfy the pride and the pleasure of man: and formed to be taken into his service. Hitherto, however, it appears to have disdained servitude, and neither force nor kindness have been able to wean it from its native independence and ferocity. But this wildness might, perhaps, in time, be surmounted; and, it is probable, the horse and the ass, when irst taken from the forest, were equally obstinate, fierce, and unmanageable. Mr. Buffon informs us, that the zebra, from which he took his description, could never be entirely mastered, notwithstanding all the efforts which were tried to tame it. They continued, indeed, to mount it, but then with such precautions as evidently showed its fierceness, for two men were obliged to hold the reins while the third ven tured upon its back; and even then it attempted to kick whenever it perceived any person approaching. That which is now in the Queen's menagerie, at Buckingham-Gate, is even more vicious than the former; and the keeper who shows it takes care to inform the spectators of its ungovernable nature. Upon my attempting to approach, it seemed quite terrified, and was preparing to kick, appearing as wild as if just caught, although taken extremely young, and used with the utmost indulgence. Yet still it is most probable that this animal, by time and assiduity, could be brought under subjection. As it resembles the horse in form, without all doubt it has a similitude of nature, and only requires the efforts of an industrious and skilful nation, to be added to the number of our domestics. It is not *now* known what were the pains and dangers which were first undergone to reclaim the breed of horses from savage ferocity: these, no doubt, made an equal opposition; but, by being opposed, by an industrious and enterprising race of mankind, their spirit was at last subdued, and their freedom restrained. It is otherwise with regard to the zebra; it is the native of countries where the human inhabitants are but little raised above the quadruped. The natives of Angola, or Caffraria, have no other idea of advantage from horses but as they are good for food; neither the fine stature of the Arabian courser, nor the delicate colourings of the zebra, have any allurements to a race of people who only consider the quantity of flesh and not its conformation. The delicacy of the zebra's shape, or the painted elegance of its form, are no more regarded by such, than by the lion that makes it his prey. For this reason, therefore, the zebra may hitherto have continued wild, because it is the native of a country where there have been no successive efforts made to reclaim it. All pursuits that have been hitherto instituted against it, were rather against its life than its liberty; the animal has thus been long taught to consider man as its most mortal enemy; and it is not to be wondered that it refuses to yield obedience where it has so seldom experienced mercy. There is a kind of knowledge in all animals, that I have often considered with amazement; which is, that they seem perfectly to know their enemies, and to avoid them. Instinct, indeed, may teach the deer to fly from the lion; or the mouse to avoid the cat: but what is the principle that teaches the dog to attack the dog-butcher wherever he sees him? In China, where the killing and dressing dogs is a trade, whenever one of these people move out, all the dogs of the village, or the street, are sure to be after him. This I should hardly have believed, but that I have seen more than one instance of it among ourselves. I have seen a poor fellow who made a practice of stealing and killing dogs for their skins, pursued in full cry for three or four streets together, by all the bolder breed of dogs, while the weaker flew from his presence with affright. How these animals could thus find out their enemy, and pursue him, appears I own unaccountable, but such is the fact; and it not only obtains in dogs, but in several other animals, though perhaps to a less degree. This very probably may have been, in some measure, a cause that has hitherto kept the zebra in its state of natural wildness; and in which it may continue, till kinder treatment shall have reconciled it to its pursuers.

It is very likely, therefore, as a more civilized people are now placed t the Cape of Good Hope, which is the chief place where this animal s found, that we may have them tamed and rendered serviceable. Nor s its extraordinary beauty the only motive we have for wishing this nimal among the number of our dependants: its swiftness is said to urpass that of all others; so that the speed of a zebra is become a roverb among the Spaniards and Portuguese. It stands better upon ts legs also than the horse; and is consequently stronger in proportion. Thus, if by proper care we improve the breed, as we have in other nstances, we should probably in time to come have a race as large as he horse, as fleet, as strong, and much more beautiful.

The zebra, as was said, is chiefly a native of the Cape of Good Hope. It is also found in the kingdom of Angola; and, as we are assured by Lopez, in several provinces also of Barbary. In those boundless forests t has nothing to restrain its liberty; it is too shy to be caught in traps, nd therefore seldom taken alive. It would seem, therefore, that none of them have ever been brought into Europe, that were caught sufficiently young, so as to be untinctured by their original state of wildness. The Portuguese, indeed, pretend that they have been able to ame them, and that they have sent four from Africa to Lisbon, which were so far brought under, as to draw the King's coach:* they add, that the person who sent them over, had the office of notary conferred upon him for his reward, which was to remain to him and his posterity for ever: but I do not find this confirmed by any person who says he saw them. Of those which were sent to Brazil, not one could be tamed; they would permit one man only to approach them; they were tied up very short; and one of them, which had by some means got loose, actually killed his groom, having bitten him to death.† Notwithstanding this, I believe, were the zebra taken up very young, and properly treated, it might be rendered as tame as any other animal; and Merolla, who saw many of them, asserts, that when tamed, which he speaks of as being common enough, they are not less estimable for their swiftness than their beauty.

This animal, which is neither to be found in Europe, Asia, or America, is nevertheless very easily fed. That which came over into England some years ago, would eat almost any thing, such as bread, meat, and tobacco; that which is now among us, subsists entirely upon hay. As it so nearly resembles the horse and the ass in structure, so it probably brings forth annually as they do. The noise they make is neither like that of a horse nor an ass, but more resembling the confused barking of a mastiff dog. In the two which I saw, there was a circumstance that seems to have escaped naturalists; which is, that the skin hangs loose below the jaw upon the neck, in a kind of dewlap, which takes away much from the general beauty. But whether this be a natural or accidental blemish, I will not take upon me to determine.

These animals are often sent as presents to the princes of the east. We are told, that one of the governors of Batavia gave a zebra, which had been sent to him from Africa, to the emperor of Japan, for which he received, as an equivalent for the company, a present, to the value of sixty thousand crowns.[*] Teller also relates, that the Great Mogul gave two thousand ducats for one of them. And it is frequent with the African ambassadors to the court of Constantinople, to bring some of these animals with them, as presents for the Grand Signior.

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* Dapper.

† Pyrard. tom. ii. p. 376.

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[*] Navendorf.

BOOK II.

OF RUMINATING ANIMALS.

CHAPTER I.

INTRODUCTION.

Of all animals, those that chew the cud are the most harmless, and the most easily tamed. As they live entirely upon vegetables, it is neither their interest nor their pleasure to make war upon the rest of the brute creation; content with the pastures where they are placed, they seldom desire to change, while they are furnished with a proper supply; and, fearing nothing from each other, they generally go in herds for their mutual security. All the fiercest of the carnivorous kinds seek their food in gloomy solitude; these, on the contrary, range together; the very meanest of them are found to unite in each other's defence; and the hare itself is a gregarious animal, in those countries where it has no other enemies but the beasts of the forest to guard against.

As the food of ruminant animals is entirely of the vegetable kind, and as this is very easily procured, so these animals seem naturally more indolent and less artful than those of the carnivorous kinds; and as their appetites are more simple, their instincts seem to be less capable of variation. The fox or the wolf are for ever prowling; their long habits of want give them a degree of sharpness and cunning; their life is a continued scene of stratagem and escape; but the patient ox, or the deer, enjoy the repast that Nature has abundantly provided; certain of subsistence, and content with security.

As nature has furnished these animals with an appetite for such coarse and simple nutriment, so she has enlarged the capacity of the intestines, to take in a greater supply. In the carnivorous kinds, as their food is nourishing and juicy, their stomachs are but small, and their intestines short; but in these, whose pasture is coarse, and where much must be accumulated before any quantity of nourishment can be obtained, their stomachs are large and numerous, and their intestines long and muscular. The bowels of a ruminating animal may be considered as an elaboratory, with vessels in it, fitted for various transmutations. It requires a long and tedious process before grass can be transmuted into flesh; and, for this purpose, Nature, in general, has furnished such animals as feed upon grass, with four stomachs, through which the food successively passes, and undergoes the proper separations.

Of the four stomachs with which ruminant animals are furnished, the first is called the *paunch*, which receives the food after it has been slightly chewed; the second is called the *honeycomb*, and is properly nothing more than a continuation of the former: these two, which are very capacious, the animal fills as fast as it can, and then lies down t ruminate; which may be properly considered as a kind of vomiting without effort or pain. The two stomachs above-mentioned being filled with as much as they can contain, and the grass, which was slightly chewed, beginning to swell with the heat of the situation, it dilates the stomachs, and these again contract upon their contents. The aliment, thus squeezed, has but two passages to escape at; one into the third stomach, which is very narrow; and the other back, by the gullet, into the mouth, which is wider. The greatest quantity, therefore, is driven back, through the largest aperture, into the mouth, to be chewed a second time; while a small part, and that only the most liquid, is driven into the third stomach, through the orifice which is so small. The food which is driven to the mouth, and chewed a second time, is thus rendered more soft and moist, and becomes at last liquid enough to pass into the conduit that goes to the third stomach, where it undergoes a still farther comminution. In this stomach, which is called the *many-fold*, from the number of its leaves, all which tend to promote digestion, the grass has the appearance of boiled spinage, but not yet sufficiently reduced, so as to make a part of the animal's nourishment: it requires the operation of the fourth stomach for this purpose, where it undergoes a complete maceration, and is separated to be turned into chyle.

But Nature has not been less careful in another respect, in fitting the intestines of these animals for their food. In the carnivorous kinds they are thin and lean; but in ruminating animals they are strong, fleshy, and well covered with fat. Every precaution seems taken that can help their digestion: their stomach is strong and muscular, the more readily to act upon its contents; their intestines are lined with fat, the better to preserve their warmth; and they are extended to a much greater length, so as to extract every part of that nourishment which their vegetable food so scantily supplies.

In this manner are all quadrupeds of the cow, the sheep, or the deer kind, seen to ruminate; being thus furnished with four stomachs, for the macerating of their food. These, therefore, may most properly be called the *ruminant kinds;* although there are many others that have this quality in a less observable degree. The rhinoceros, the camel, the horse, the rabbit, the marmot, and the squirrel, all chew the cud by intervals, although they are not furnished with stomachs like the former. But not these alone, there are numberless other animals that appear to ruminate; not only birds, but fishes and insects. Among birds are the pelican, the stork, the heron, the pigeon, and the turtle; these have a power of disgorging their food to feed their young. Among fishes are lobsters, crabs, and that fish called the *dorado*. The salmon also is said to be of this number: and, if we may believe Ovid, the scarus likewise, of which he says:*

> Of all the fish that graze beneath the flooo,
> He *only* ruminates his former food.

Of insects, the ruminating tribe is still larger; the mole, the cricket, the wasp, the drone, the bee, the grasshopper, and the beetle. All these animals either actually chew the cud, or seem at least to ruminate. They have the stomach composed of muscular fibres, by means whereof the food is ground up and down, in the same manner as in those which are particularly distinguished by the appellation of *ruminants.*

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* At contra herbosa pisces laxantur arena,
Ut scarus epastas *solus* oui ruminat escas.

But not these alone; men themselves have been often known to ruminate, and some even with pleasure. The accounts of these calamities, for such I must consider them, incident to our fellow-creatures, are not very pleasant to read; yet I must transcribe a short one, as given us by Slare, in the Philosophical Transactions, as it may in some measure show the satisfaction which the lower tribes of animals enjoy while they ruminate. The man in question was a citizen of Bristol, of about twenty years of age, and, what seemed more extraordinary still, of a ruminating family, for his father was frequently subject to the same infirmity, or amusement, as he himself perhaps would call it. This young man usually began to chew his meat over again within about a quarter of an hour after eating. His ruminating after a full meal generally lasted about an hour and a half; nor could he sleep until his task was performed. The victuals, upon the return, tasted even more pleasantly than at first; and returned as if they had been beaten up in a mortar. If he ate a variety of things, that which he ate at first came up again first; and if this return was interrupted for any time, it produced sickness and disorder, and he was never well till it returned. Instances of this kind, however, are rare and accidental; and it is happy for mankind that they are so. Of all other animals, we spend the least time in eating; this is one of the great distinctions between us and the brute creation; and eating is a pleasure of so low a kind, that none but such as are nearly allied to the quadruped, desire its prolongation.

CHAPTER II.

OF QUADRUPEDS OF THE COW KIND.

Of all ruminant animals, those of the cow kind deserve the first rank, both for their size, their beauty, and their services. The horse is more properly an animal belonging to the rich; the sheep chiefly thrives in a flock, and requires attendance; but the cow is more especially the poor man's pride, his riches, and his support. There are many of our peasantry that have no other possession but a cow; and even of the advantages resulting from this most useful creature, the poor are but the nominal possessors. Its flesh they cannot pretend to taste, since then their whole riches are at once destroyed; its calf they are obliged to fatten for sale, since veal is a delicacy they could not make any pretensions to; its very milk is wrought into butter and cheese for the tables of their masters; while they have no share even in their own possession, but the choice of their market, I cannot bear to hear the rich crying out for liberty, while they thus starve their fellow-creatures, and feed them up with an imaginary good, while they monopolize the real benefits of Nature.

In those countries where the men are under better subordination, this excellent animal is of more general advantage. In Germany, P land, and Switzerland, every peasant keeps two or three cows, not for the benefit of his master, but for himself. The meanest of the peasants there kills one cow at least for his own table, which he salts and hangs up, and thus preserves as a delicacy all the year round. There is scarce a cottage in those countries that is not hung round with these marks of hospitality; and which often make the owner better contented with hunger, since he has it in his power to be luxurious when he thinks proper. A piece of beef hung up there, is considered as an elegant piece of furniture, which though seldom touched, at least argues the possessor's opulence and ease. But it is very different, for some years past, in this country, where our lower rustics at least are utterly unable to purchase meat any part of the year, and by them even butter is considered as an article of extravagance.

The climate and pasture of Great Britain, however, is excellently adapted to this animal's moderate nature; and the verdure and the fertility of our plains are perfectly suited to the manner of its feeding; for wanting the upper fore-teeth, it loves to graze in a high rich pasture. This animal seems but little regardful of the quality of its food, provided it be supplied in sufficient abundance; it makes no particular distinctions in the choice of its herbage, but indiscriminately and hastily devours the proper quantity. For this reason, in our pastures, where the grass is rather high than succulent, more flourishing than nutritious, the cow thrives admirably; and there is no part of Europe where the tame animal grows larger, yields more milk, and more readily fattens, than with us.

Our pastures supply them with abundance, and they in return enrich the pasture; for, of all animals, the cow seems to give back more than it takes from the soil. The horse and the sheep are known, in a course of years, to impoverish the ground. The land where they have fed becomes weedy, and the vegetables coarse and unpalatable on the contrary, the pasture where the cow has been bred, acquires a finer, softer surface, and becomes every year more beautiful and even. The reason is, that the horse being furnished with fore-teeth in the upper jaw, nips the grass closely, and therefore only chooses that which is the most delicate and tender; the sheep also, though, with respect to its teeth, formed like the cow, only bites the most succulent parts of the herbage, these animals, therefore, leave all the high weeds standing; and while they cut the finer grass too closely, suffer the ranker herbage to vegetate and overrun the pasture. But it is otherwise with the cow; as its teeth cannot come so close to the ground as those of the horse, nor so readily as those of the sheep, which are less, it is obliged, to feed upon the tallest vegetables that offer; thus it eats them all down, and, in time, levels the surface of the pasture.

The age of the cow is known by the teeth and horns. This animal is furnished with eight cutting teeth in the lower jaw; at the age of ten months, the two middlemost of these fall out, and are replaced by others, that are not so white, but broader; at the age of sixteen months, the two next milk-white teeth fall out likewise, and others come up in their room: thus, at the end of every six months, the creature loses and gains, till at the age of three years, all the cutting teeth are renewed, and then they are long, pretty white, and equal; but in proportion as he animal advances in years, they become irregular and black, their nequalities become smoother, and the animal less capable of chewing ts food. Thus the cow often declines from this single cause; for as it s obliged to eat a great deal to support life, and as the smoothness of he teeth makes the difficulty of chewing great, a sufficient quantity of ood cannot be supplied to the stomach. Thus the poor animal sinks n the midst of plenty, and every year grows leaner and leaner, till it ies.

The horns are another, and a surer method of determining this ani- al's age. At three years old, it sheds its horns, and new ones arise n their place, which continue as long as it lives; at four years of age, he cow has small, pointed, neat, smooth horns, thickest near the head; t five the horns become larger, and are marked round with the former ear's growth. Thus, while the animal continues to live, the horns ontinue to lengthen; and every year a new ring is added at the root, o that allowing three years before their appearance, and then reckon- ng the number of rings, we have in both together the animal's age exactly.

As we have indisputably the best breed of horned cattle of any in urope, so it was not without the same assiduity that we came to excel in hese, as in our horses. The breed of cows has been entirely improved by foreign mixture, properly adapted to supply the imperfections of our wn. Such as are purely British, are far inferior in size to those on nany parts of the continent; but those which we have thus improved, y far excel all others. Our Lincolnshire kind derive their size from he Holstein breed: and the large hornless cattle that are bred in some arts of England, came originally from Poland. We were once famous or a wild breed of these animals, but these have long since been worn ut; and perhaps no kingdom in Europe can furnish so few wild ani- als of all kinds as our own. Cultivation and agriculture are sure to anish these, wherever they are found; and every addition a country eceives from Art, drives away those animals that are only fitted for a tate of Nature.

Of all quadrupeds, the cow seems most liable to alteration from its asture. In the different parts of our own country, we easily perceive he great varieties produced among these animals, by the richness or overty of the soil. In some they grow to a great bulk; and I have een an ox sixteen hands high, which is taller than the general run of ur horses. In others, they appear as diminutive; being not so large s an ass. The breed of the Isle of Man, and most parts of Scotland, s much less in general than in England or Ireland: they are differently haped also, the dewlap being much smaller, and, as the expression is, he beast has more of the ewe neck. This, till some years ago, was onsidered in cattle as a deformity; and the cow was chosen, accord- ng to Virgil's direction, with a large dewlap: however, at present it is he universal opinion, that the cow wants in udder what it has in neck, nd the larger the dewlap, the smaller is the quantity of its milk. Our raziers now, therefore, endeavour to mix the two breeds; the large Holstein with the small northern; and from both results that fine milch reed, which excels the cattle of any other part of the world.

This difference, arising from pasture, is more observable in other ountries than in our own. The cow kind is to be found in almost every part of the world, large in proportion to the richness of the pasture; and small, as the animal is stinted in its food. Thus Africa is remarkable for the largest and the smallest cattle of this kind; as is also India, Poland, Switzerland, and several other parts of Europe. Among the Elut Tartars, where the pastures are remarkably rich and nourishing, the cow becomes so large, that he must be a tall man who can reach the tip of its shoulder. On the contrary, in France, where the animal is stinted in its food, and driven from the most flourishing pastures, it greatly degenerates.

But the differences in the size of this animal are not so remarkable as those which are found in its form, its hair, and its horns. The difference is so very extraordinary in many of them, that they have been even considered as a different kind of creature, and names have been given them as a distinct species, when in reality they are all the same.* In this manner the urus and the bison have been considered, from the variety in their make, to be distinct in their production; but they are all in fact the descendants of one common stock, as they have that certain mark of unity, they breed and propagate among each other. Naturalists have therefore laboured under an obvious error, when, because of the extreme bulk of the urus, or because of the hump upon the back of the bison, they assigned them different places in the creation, and separated a class of animals, which was really united. It is true, the horse and the ass do not differ so much in form, as the cow and the bison; nevertheless, the former are distinct animals, as their breed is marked with sterility; the latter are animals of the same kind, as their breed is fruitful, and a race of animals is produced, in which the hump belonging to the bison is soon worn away. The differences, therefore, between the cow, the urus, and the bison, are merely accidental. The same caprice in Nature that has given horns to some cows, and denied them to others, may also have given the bison a hump, or increased the bulk of the urus; it may have given the one a mane, or denied a sufficiency of hair to the other.

But before we proceed farther, it may be proper to describe these varieties, which have been thus taken for distinct kinds.† The urus, or wild bull, is chiefly to be met with in the province of Lithuania; and grows to a size, that scarce any other animal, except the elephant, is found to equal. It is quite black, except a stripe mixed with white, that runs from the neck to the tail, along the top of the back; the horns are short, thick, and strong; the eyes are fierce and fiery; the forehead is adorned with a kind of garland of black curled hair, and some of them are found to have beards of the same; the neck is short and strong, and the skin has an odour of musk. The female, though not so big as the male, exceeds the largest of our bulls in size; nevertheless, her udder and teats are so small, that they can scarcely be perceived. Upon the whole, however, this animal resembles the tame one very exactly, except in some trifling varieties, which his state of wildness, or the richness of the pastures where he is found, may easily have produced.

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* Buffon, vol. xxiii. p. 78.

† This description is chiefly taken from Klein.

The bison, which is another variety of the cow kind, differs from the rest, in having a lump between its shoulders. These animals are of various kinds; some very large, others as diminutively little. In general, to regard this animal's fore-parts, he has somewhat the look of a lion, with a long shaggy mane, and a beard under his chin; his head is little, his eyes red and fiery, with a furious look; the forehead is large, and the horns so big, and so far asunder, that three men might often sit between them. On the middle of the back there grows a bunch almost as high as that of a camel, covered with hair, and which is considered as a great delicacy by those that hunt him. There is no pursuing him with safety, except in forests where there are trees large enough to hide the hunters. He is generally taken by pit-falls; the inhabitants of those countries where he is found wild, digging holes in the ground, and covering them over with boughs of trees and grass; then provoking the bison to pursue them, they get on the opposite side of the pit-fall, while the furious animal, running head foremost, falls into the pit prepared for him, and is there quickly overcome and slain.

Besides these real distinctions in the cow kind, there have been many others made, that appear to be in name only. Thus the bonassus, of which naturalists have given us long descriptions, is supposed by Klein and Buffon to be no more than another name for the bison, as the descriptions given of them by the ancients coincide. The bubalus also of the ancients, which some have supposed to belong to the cow kind, Buffon places among the lower class of ruminant quadrupeds, as it most resembles them in size, shape, and the figure of its horns. Of all the varieties, therefore, of the cow kind, there are but two that are really distinct; namely, the cow, and the buffalo: these two are separated by Nature; they seem to bear an antipathy to each other; they avoid each other, and may be considered as much removed as the horse is from the ass or the zebra. When, therefore, we have described the varieties of the cow kind, we shall pass on to the buffalo, which being a different animal, requires a separate history.

There is scarce a part of the world, as was said before, in which the cow is not found in some one of its varieties; either large, like the urus, or humped, as the bison; with straight horns, or bending, inverted backwards, or turning sideways to the cheek, like those of the ram; and in many countries, they are found without any horns whatsoever. But, to be more particular, beginning at the north, the few kine which subsists in Iceland, are without horns, although of the same race originally with ours. The size of these is rather relative to the goodness of the pasture, than the warmth or coldness of the climate. The Dutch frequently bring great quantities of lean cattle from Denmark, which they fatten on their own rich grounds. These are in general of a larger size than their own natural breed; and they fatten very easily. The cattle of the Ukraine, where the pasture is excellent, become very fat, and are considered as one of the largest breeds of Europe. In Switzerland, where the mountains are covered with a rich nourishing herbage, which is entirely reserved for their kine, these animals grow to a very large size. On the contrary, in France, where they get no other grass but what is thought unfit for horses, they dwindle, and grow lean. In some parts of Spain, the cow grows to a good size; those wild bulls, however, which they pride themselves so much in combating, are a very mean, despicable, little animal, and somewhat shaped like one of our cows, with nothing of that peculiar sternness of aspect for which our bulls are remarkable In Barbary, and the provinces of Africa, where the ground is dry, and the pasturage short, the cows are of a very small breed, and give milk in proportion. On the contrary, in Ethiopia, they are of a prodigious bigness. The same holds in Persia and Tartary; where, in some places, they are very small, and in others, of an amazing stature. It is thus, in almost every part of the world, this animal is found to correspond in size to the quantity of its provision.

If we examine the form of these animals, as they are found tame, in different regions, we shall find, that the breed of the urus, or those without a hump, chiefly occupies the cold and the temperate zones, and is not so much dispersed towards the south. On the contrary, the breed of the bison, or the animal with a hump, is found in all the southern parts of the world; throughout the vast continent of India; throughout Africa, from Mount Atlas to the Cape of Good Hope. In all these countries, the bison seems chiefly to prevail; where they are found to have a smooth, soft hair, are very nimble of foot, and, in some measure, supply the want of horses. The bison breed is also more expert and docile than ours; many of them, when they carry burdens, bend their knees to take them up, or set them down: they are treated, therefore, by the natives of those countries, with a degree of tenderness and care equal to their utility; and the respect for them in India has degenerated even into blind adoration. But it is among the Hottentots where these animals are chiefly esteemed, as being more than commonly serviceable. They are their fellow-domestics, the companions of their pleasures and fatigues; the cow is at once the Hottentot's protector and servant, assists him in attending his flocks, and guarding them against every invader; while the sheep are grazing, the faithful backely, as this kind of cow is called, stands, or grazes beside them: still, however, attentive to the looks of its master, the backely flies round the field, herds in the sheep that are straying, obliges them to keep within proper limits, and shows no mercy to robbers, or even strangers, who attempt to plunder. But it is not the plunderers of the flock alone, but even the enemies of the nation, that these backelies are taught to combat. Every army of Hottentots is furnished with a proper herd of these, which are let loose against the enemy, when the occasion is most convenient. Being thus sent forward, they overturn all before them; they strike every opposer down with their horns, and trample upon them with their feet; and thus often procure their masters an easy victory, even before they have attempted to strike a blow. An animal so serviceable, it may be supposed, is not without its reward. The backely lives in the same cottage with his master, and, by long habit, gains an affection for him; and in proportion as the man approaches to the brute, so the brute seems to attain even to some share of human sagacity. The Hottentot and his backely thus mutually assist each other; and when the latter happens to die, a new one is chosen to succeed him, by a council of the old men of the village. The new backely is then joined with one of the veterans of his own kind, from whom he learns his art, becomes social and diligent, and is taken for life into human friendship and protection.

The bisons, or cows with a hump, are found to differ very much from each other in the several parts of the world where they are found. The wild ones of this kind, as with us, are much larger than the tame. Some have horns, and some are without any; some have them depressed, and some raised in such a manner that they are used as weapons of annoyance or defence; some are extremely large, and others among them, such as the zebu, or Barbary cow, are very small. They are all, however, equally docile and gentle when tamed; and, in general, furnished with a fine, lustrous, soft hair, more beautiful than that of our own breed; their hump is also of different sizes, in some weighing from forty to fifty pounds, in others less; it is not, however, to be considered as a part necessarily belonging to the animal; and probably it might be cut away without much injury: it resembles a gristly fat; and, as I am assured, cuts and tastes somewhat like a dressed udder. The bisons of Malabar, Abyssinia, and Madagascar, are of the great kind, as the pastures there are plentiful. Those of Arabia Petræa, and most parts of Africa, are small, and of the zebu or little kind. In America, especially towards the north, the bison is well known. The American bison, however, is found to be rather less than that of the ancient continent; its hair is longer and thicker, its beard more remarkable, and its hide more lustrous and soft. There are many of them brought up tame in Carolina; however, their wild dispositions still seem to continue, for they break through all fences to get into the corn-fields, and lead the whole tame herd after them, wherever they penetrate. They breed also with the tame kinds originally brought over from Europe; and thus produce a race peculiar to that country.

From all this it appears,* that naturalists have given various names to animals in reality the same, and only differing in some few accidental circumstances. The wild cow and the tame, the animal belonging to Europe, and that of Asia, Africa, and America, the bonassus and the urus, the bison and the zebu, are all one and the same, propagate among each other, and, in the course of a few generations, the hump wears away, and scarce any vestiges of savage fierceness are found to remain. Of all animals, therefore, except man alone, the cow seems most extensively propagated. Its nature seems equally capable of the rigours of heat and cold. It is an inhabitant as well of the frozen fields of Iceland, as the burning deserts of Lybia. It seems an ancient inmate in every climate, domestic and tame in those countries which have been civilized, savage and wild in the countries which are less peopled, but capable of being made useful in all: able to defend itself in a state of nature against the most powerful enemy of the forest; and only subordinate to man, whose force it has experienced, and whose aid it at last seems to require. However wild the calves are, which are taken from the dam in a savage state, either in Africa or Asia, they soon become humble, patient, and familiar; and man may be considered in those countries, as almost helpless without their assistance. Other animals preserve their nature or their form with inflexible perseverance; but these, in every respect, suit themselves to the appetites and conveniences of mankind; and as their shapes are found to alter, so also does their nature; in no animal is there seen a greater variety of kinds, and in none a more humble and pliant disposition.

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* Buffon, vol. xxiii. p. 130.

THE BUFFALO.

If we should compare the shape of our common cow with that of the bison, the difference will appear very great. The shaggy mane of the latter, the beard, the curled forehead, the inverted horns, the broad breast, and the narrow hinder parts, give it the appearance rather of a lion than a cow; and fit it more for a state of war with mankind, than a state of servitude. Yet, notwithstanding these appearances, both animals are found to be the same; or at least so nearly allied, that they breed among each other, and propagate a race that continues the kind.

On the other hand, if we compare the buffalo with our common cow, no two animals can be more nearly alike, either in their form or their nature; both equally submissive to the yoke, both often living under the same roof, and employed in the same domestic services; the make and the turn of their bodies so much alike,* that it requires a close attention to distinguish them; and yet, after all this, no two animals can be more distinct, or seem to have stronger antipathies to each other. Were there but one of each kind remaining, it is probable the race of both would shortly be extinct. However, such is the fixed aversion formed between these creatures, that the cow refuses to breed with the buffalo, which it nearly resembles; while it is known to propagate with the bison, to which it has, in point of form, but a very distant similitude.

The buffalo is, upon the whole, by no means so beautiful a creature as the cow; his figure is more clumsy and awkward; his air is wilder; and he carries his head lower, and nearer the ground; his limbs are less fleshy, and his tail more naked of hair; his body is shorter and thicker than that of the cow kind; his legs are higher; his head smaller; his horns not so round, black, and compressed, with a bunch of curled hair hanging down between them; his skin is also harder and thicker, more black, and less furnished with hair; his flesh, which is hard and blackish, is not only disagreeable to the taste, but likewise to the smell. The milk of the female is by no means so good as that of the cow; it is however produced in great abundance. In the warm countries, almost all their cheese is made of the milk of the buffalo; and they supply butter also in large quantities. The veal of the young buffalo is not better eating than the beef of the old. The hide of this animal seems to be the most valuable thing he furnishes. The leather made of it is well known for its thickness, softness, and impenetrability. As these animals are, in general, larger and stronger than the cow, they are usefully employed in agriculture. They are used in drawing burdens, and sometimes in carrying them; being guided by a ring, which is thrust through their nose. Two buffaloes yoked in a wagon, are said to draw more than four strong horses; as their heads and necks are naturally bent downward, they are thus better fitted for the draught, and the whole weight of their bodies is applied to the carriage that is to be drawn forward

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* Buffon.

Buffalo

Bison, p. 33.

Sheep, p. 39.

To face p. 36. vol. ii.

From the size and bulk of the buffalo, we may be easily led to conclude that he is a native of the warmer climates. The largest quadrupeds are generally found in the torrid zone; and the buffalo is inferior, in point of size, only to the elephant, the rhinoceros, or the hippopotamos. The cameleopard or the camel may indeed be taller, but they are neither so long, nor near so corpulent. Accordingly, we find this animal wild in many parts of India; and tamed, also, wherever the natives have occasion for his services. The wild buffaloes are very dangerous animals, and are often found to gore travellers to death, and then trample them with their feet, until they have entirely mangled the whole body: however, in the woods they are not so much to be feared as in the plains, because in the violence of their pursuit their large horns are apt to be entangled in the branches of the trees, which gives those who have been surprised by them time to escape the danger. There is scarce any other method of avoiding their pursuit; they run with great swiftness; they overturn a tree of moderate growth; and are such swimmers, as to cross the largest rivers without any difficulty. In this manner, like all other large animals of the torrid zone, they are very fond of the water; and, in the midst of their pursuit, often plunge in, in order to cool themselves. The Negroes of Guinea, and the Indians of Malabar, where buffaloes are in great abundance, take great delight in hunting and destroying them; however, they never attempt to face the buffalo openly, but, generally climbing up the tree, shoot at him from thence, and do not come down till they find they have effectually dispatched him. When they are tamed, no animal can be more patient or humble; and though by no means so docile as the cow kind, yet they go through domestic drudgeries with more strength and perseverance.

Although these animals be chiefly found in the torrid zone, yet they are bred in several parts of Europe, particularly in Italy, where they make the food and the riches of the poor. The female produces but one at a time, in the same manner as the cow; but they are very different in the times of gestation; for the cow, as we know, goes but nine months; whereas the buffalo continues pregnant for twelve. They are all afraid of fire; and, perhaps, in consequence of this, have an aversion to red colours, that resemble the colour of flame: it is said, that in those countries where they are found in plenty, no person dares to dress in scarlet. In general, they are inoffensive animals, if undisturbed; as, indeed, all those which feed upon grass are found to be; but when they are wounded, or when even but fired at, nothing then can stop their fury; they then turn up the ground with their fore-feet, bellow much louder and more terribly than the bull, and make at the object of their resentment with ungovernable rage. It is happy, in such circumstances, if the person they pursue has a wall to escape over, or some such obstacle, otherwise they soon overtake, and instantly destroy him. It is remarkable, however, that although their horns are so very formidable, they in general make more use of their feet in combat, and rather tread their enemies to death than gore them.

Having thus gone through the history of these animals, it may be proper to observe, that no names have been more indiscriminately used than those of the bull, the urus, the bison, and the buffalo. It therefore becomes such as would have distinct ideas of each, to be careful in separating the kinds, the one from the other, allowing the cow for the standard of all. The urus, whether of the large, enormous kind of Lithuania, or the smaller race of Spain. whether with long or short horns, whether with or without long hair in the forehead, is every way the same with what our common breed was before they were taken from the forest, and reduced to a state of servitude. The bison, and all its varieties, which are known by a hump between the shoulders, is also to be remarked in the same class. This animal, whether with crooked or straight horns, whether they be turned towards the cheek, or totally wanting, whether it be large or diminutive, whatever be its colour, or whatever the length of its hair, whether called the *bonassus* by some, or the *bubalus* by others, is but a variety of the cow kind, with whom it breeds, and with whom of consequence it has the closest connexion. Lastly, the buffalo, though shaped much more like the cow, is a distinct kind by itself, that never mixes with any of the former; that goes twelve months with young; whereas the cow goes but nine; that testifies an aversion to the latter; and though bred under the same roof, or feeding in the same pasture, has always kept separate; and makes a distinct race in all parts of the world. These two kinds are supposed to be the only real varieties in the cow kind, of which naturalists have given so many varieties. With respect to some circumstances mentioned by travellers, such as that of many kinds defending themselves by voiding their dung against their pursuers; this is a practice which they have in common with other timid creatures when pursued, and arises rather from fear than a desire of defence. The musky smell also by which some have been distinguished, is found common to many of these kinds, in a state of nature; and does not properly make the characteristic marks of any. The particular kind of noise, also, which some of them are known to make, which rather resembles grunting, than bellowing, or lowing, is but a savage variety, which many wild animals have, and yet lose when brought into a state of tameness. For these reasons, Mr. Buffon, whom I have followed in this description, is of opinion, that the zebu, or little African cow, and the grunting, or Siberian cow, are but different races of the bison; as the shape of the horns, or the length of the hair, are never properly characteristic marks of any animal, but are found to vary with climate, food, and cultivation.

In this manner, the number of animals of the cow kind, which naturalists have extended to eight or ten sorts, are reduced to two; and as the utmost deference is paid to the opinion of Mr. Buffon in this particular, I have taken him for my guide. Nevertheless, there is an animal of the cow kind, which neither he, nor any other naturalist that I know of, has hitherto described, yet which makes a very distinct class, and may be added as a third species.

This animal was shown some years ago in London, and seemed to unite many of the characteristics of the cow and the hog; having the head, the horns, and the tail of the former; with the bristles, the colour, and the grunting of the latter. It was about the size of an ass, but broader and thicker; the colour resembling that of a hog, and the hair bristly, as in that animal. The hair upon the body was thin, as in the hog; and a row of bristles ran along the spine, rather shorter and softer than in the hog kind. The head was rather larger than that of a cow: the teeth were entirely resembling those of that animal, and the tongue was rough in like manner. It fed upon hay; and, consequently its internal conformation must have resembled that of the cow kind more than the hog, whose food is always chosen of a kind more succulent. The eyes were placed in the head as with the cow, and were pretty nearly of the same colour; the horns were black and flattish, but bent rather backwards to the neck, as in the goat kind; the neck was short and thick, and the back rather rising in the middle; it was cloven footed, like the cow, without those hinder claws that are found in the hog kinds. But the greatest variety of all in this extraordinary creature, which was a female, was, that it had but two teats, and, consequently, in that respect, resembled neither of the kinds to which, in other circumstances, it bore so strong a similitude. Whether this animal was a distinct kind or a monster, I will not pretend to say; it was shown under the name of the bonassus: and it was said, by the person who showed it, to have come from India; but no credit is to be given to interested ignorance; the person only wanted to make the animal appear as extraordinary as possible; and, I believe, would scarcely scruple a lie or two, to increase that wonder in us, by which he found the means of living.

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CHAPTER III.

OF ANIMALS OF THE SHEEP AND GOAT KIND.

As no two animals are found entirely the same, so it is not to be expected that any two races of animals should exactly correspond in every particular. The goat and the sheep are apparently different in the form of their bodies, in their covering, and in their horns. They may, from hence, be considered as two different kinds, with regard to all common and domestic purposes. But if we come to examine them closer, and observe their internal conformation, no two animals can be more alike; their feet, their four stomachs, their suet, their appetites, all are entirely the same, and show the similitude between them: but what makes a much stronger connexion is, that they propagate with each other. The buck goat is found to produce with the ewe an animal that, in two or three generations, returns to the sheep, and seems to retain no mark of its ancient progenitor.* The sheep and the goat, therefore, may be considered as belonging to one family; and were the whole races reduced to one of each, they would quickly replenish the earth with their kind.

If we examine the sheep and goat internally, we shall find, as was said, that their conformation is entirely the same; nor is their structure very remote from that of the cow kind, which they resemble in their hoofs, and in their chewing the cud. Indeed, all ruminant animals are internally very much alike. The goat, the sheep, or the deer, exhibit to the eye of the anatomist the same parts in miniature, which the cow or the bison exhibited in the great. But the differences between these animals are, nevertheless, sufficiently apparent. Nature has obviously marked the distinctions between the cow and the sheep kind, by their form and size; and they are also distinguished from those of the deer kind, by never shedding their horns. Indeed, the form and figure of these animals, if there were nothing else, would seldom fail of guiding us to the kind; and we might almost, upon sight, tell which belong to the deer kind, and which are to be degraded into that of the goat. However, the annually shedding the horns in the deer, and the permanence in the sheep, draws a pretty exact line between the kinds; so that we may hold to this distinction only, and define the sheep and goat kind as ruminant animals of a smaller size, that never shed their horns.

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* Buffon passim.

If we consider these harmless and useful animals in one point of view, we shall find that both have been long reclaimed, and brought into a state of domestic servitude. Both seem to require protection from man; and are, in some measure, pleased with his society. The sheep, indeed, is the more serviceable creature of the two; but the goat has more sensibility and attachment. The attending upon both was once the employment of the wisest and the best of men; and those have been ever supposed the happiest times in which these harmless creatures were considered as the chief objects of human attention. In the earliest ages, the goat seemed rather the greater favourite; and, indeed, it continues such, in some countries, to this day, among the poor. However, the sheep has long since become the principal object of human care; while the goat is disregarded by the generality of mankind, or become the possession only of the lowest of the people. The sheep, therefore, and its varieties, may be considered first; and the goat, with all those of its kind, will then properly follow.

THE SHEEP.

Those animals that take refuge under the protection of man, in a few generations become indolent and helpless. Having lost the habit of self-defence, they seem to lose also the instincts of Nature. The sheep, in its present domestic state, is of all animals the most defenceless and inoffensive. With its liberty, it seems to have been deprived of its swiftness and cunning; and what in the ass might rather be called patience, in the sheep appears to be stupidity. With no one quality to fit it for self-preservation, it makes vain efforts at all. Without swiftness, it endeavours to fly; and without strength, sometimes offers to oppose. But these feeble attempts rather incite than repress the insult of every enemy; and the dog follows the flock, with greater delight upon seeing them fly, and attacks them with more fierceness upon their unsupported attempts at resistance. Indeed they run together in flocks, rather with the hopes of losing their single danger in the crowd, than of uniting to repress the attack by numbers. The sheep, therefore, were it exposed in its present state to struggle with its natural enemies of the forest, would soon be extirpated. Loaded with a heavy fleece, deprived of the defence of its horns, and rendered heavy, slow, and feeble, it can have no other safety than what it finds from man. This animal is now, therefore, obliged to rely solely upon that art for protection, to which it originally owes its degradation.

But we are not to impute to Nature the formation of an animal so utterly unprovided against its enemies, and so unfit for defence. The moufflon, which is the sheep in a savage state, is a bold, fleet creature, able to escape from the greater animals by its swiftness, or to oppose the smaller kinds with the arms it has received from nature. It is by human art alone that the sheep has become the tardy, defenceless creature we find it. Every race of quadrupeds might easily be corrupted by the same allurements by which the sheep has been thus debilitated and depressed. While undisturbed, and properly supplied, none are found to set any bounds to their appetite. They all pursue their food while able, and continue to graze, till they often die of disorders occasioned by too much fatness. But it is very different with them in a state of nature: they are in the forest surrounded by dangers, and alarmed with unceasing hostilities; they are pursued every hour from one tract of country to another; and spend a greater part of their time in attempts to avoid their enemies. Thus constantly exercised, and continually practising all the arts of defence and escape, the animal at once preserves its life and native independence, together with its swiftness, and the slender agility of its form.

The sheep, in its servile state, seems to be divested of all inclinations of its own; and of all animals it appears the most stupid. Every quadruped has a peculiar turn of countenance, a physiognomy, if we may so call it, that generally marks its nature. The sheep seems to have none of those traits that betoken either courage or cunning; its large eyes, separated from each other, its ears sticking out on each side, and its narrow nostrils, all testify the extreme simplicity of this creature; and the position of its horns, also show that Nature designed the sheep rather for flight than combat. It appears a large mass of flesh, supported upon four small, straight legs, ill fitted for carrying such a burden; its motions are awkward, it is easily fatigued, and often sinks under the weight of its own corpulency. In proportion as these marks of human transformation are more numerous, the animal becomes more helpless and stupid. Those which live upon a more fertile pasture, and grow fat, become entirely feeble; those that want horns are found more dull and heavy than the rest;* those whose fleeces are longest and finest, are more subject to a variety of disorders; and, in short, whatever changes have been wrought in this animal by the industry of man, are entirely calculated for human advantage, and not for that of the creature itself. It might require a succession of ages, before the sheep could be restored to its primitive state of activity, so as to become a match for its pursuers of the forest.

The goat, which it resembles in so many other respects, is much its superior. The one has its particular attachments, sees danger, and generally contrives to escape it; but the other is timid without a cause, and secure when real danger approaches. Nor is the sheep, when bred up tame in the house, and familiarized with its keepers, less obstinately absurd: from being dull and timid, it then acquires a degree of pert familiarity: butts with its head, becomes mischievous, and shows itself every way unworthy of being singled out from the rest of the flock. Thus it seems rather formed for slavery than friendship; and framed more for the necessities than the amusements of mankind. There is but one instance in which the sheep shows any attachment to its keeper; and that is seen rather on the continent than among us in Great Britain. What I allude to is, their following the sound of the shepherd's pipe. Before I had seen them trained in this manner, I had no conception of those descriptions in the old pastoral poets, of the shepherd leading his flock from one country to another. As I had been used only to see these harmless creatures driven before their keepers, I supposed that all the rest was but invention: but in many parts of the Alps, and even some provinces of France, the shepherd and his pipe are still continued with true antique simplicity. The flock is regularly penned every evening, to preserve them from the wolf; and the shepherd returns homeward at sun-set with his sheep following him, and seemingly pleased with the sound of the pipe, which is blown with a reed, and resembles the chanter of the bagpipe. In this manner, in those countries that still continue poor, the Arcadian life is preserved in all its former purity; but in countries where a greater inequality of conditions prevail, the shepherd is generally some poor wretch who attends a flock from which he is to derive no benefits, and only guards those luxuries which he is not fated to share.

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* Daubenton upon the Sheep.

It does not appear, from early writers, that the sheep was bred in Britain; and it was not till several ages after this animal was cultivated, that the woollen manufacture was carried on among us.* That valuable branch of business lay for a considerable time in foreign hands; and we were obliged to import the cloth, manufactured from our own materials. There were, notwithstanding, many unavailing efforts among our kings to introduce and preserve the manufacture at home. Henry the Second, by a patent granted to the weavers in London, directed, that if any cloth was found made of a mixture of Spanish wool, it should be burned by the mayor. Such edicts at length, although but slowly, operated towards the establishing this trade among us. The Flemings, who at the revival of arts possessed the art of cloth-working in a superior degree, were invited to settle here; and soon after foreign cloth was prohibited from being worn in England. In the times of queen Elizabeth, this manufacture received every encouragement; and many of the inhabitants of the Netherlands being then forced, by the tyranny of Spain, to take refuge in this country, they improved us in those arts, in which we at present excel the rest of the world. Every art, however, has its rise, its meridian, and its decline; and it is supposed by many, that the woollen manufacture has for some time been decaying amongst us. The cloth now made is thought to be much worse than that of some years past; being neither so firm nor so fine; neither so much courted abroad, nor so serviceable at home.

No country, however, produces such sheep as England; either with larger fleeces, or better adapted for the business of clothing. Those of Spain, indeed, are finer, and we generally require some of their wool

* British Zoology, vol. i. p. 23

to work up with our own: but the weight of a Spanish fleece is no way comparable to one of Lincoln or Warwickshire; and, in those counties, it is no uncommon thing to give 100 guineas for a ram.

The sheep without horns are counted the best sort, because a great part of the animal's nourishment is supposed to go up into the horns.[*] Sheep, like other ruminant animals, want the upper fore-teeth; but have eight in the lower jaw: two of these drop, and are replaced at two years old; four of them are replaced at three years old; and all at four. The new teeth are easily known from the rest, by their freshness and whiteness. There are some breeds, however, in England, that never change their teeth at all; these the shepherds call the *leather-mouthed cattle;* and, as their teeth are thus longer wearing, they are generally supposed to grow old a year or two before the rest.[†] The sheep bring forth one or two at a time; and sometimes three or four. The first lamb of a ewe is generally pot-bellied, short, and thick, and of less value than those of a second or third production; the third being supposed the best of all. They bear their young five months; and, by being housed, they bring forth at any time of the year.

But this animal, in its domestic state, is too well known to require a detail of its peculiar habits, or of the arts which have been used to improve the breed. Indeed, in the eye of an observer of Nature, every art which tends to render the creature more helpless and useless to itself, may be considered rather as an injury than an improvement; and if we are to look for this animal in its noblest state, we must seek for it in the African desert, or the extensive plains of Siberia. Among the degenerate descendants of the wild sheep, there have been so many changes wrought, as entirely to disguise the kind, and often to mislead the observer. The variety is so great that scarce any two countries has its sheep of the same kind, but there is found a manifest difference in all, either in the size, the covering, the shape, or the horns.

The woolly sheep,[‡] as it is seen among us, is found only in Europe, and some of the temperate provinces of Asia. When transported into warmer countries, either into Florida or Guinea, it loses its wool, and assumes a covering fitted to the climate, becoming hairy and rough; it there also loses its fertility, and its flesh no longer has the same flavour. In the same manner, in the very cold countries, it seems equally helpless and a stranger; it still requires the unceasing attention of mankind for its preservation; and although it is found to subsist, as well in Greenland as in Guinea,[§] yet it seems a natural inhabitant of neither.

Of the domestic kinds to be found in the different parts of the world, besides our own, which is common in Europe, the first variety is to be seen in Iceland, Muscovy, and the coldest climates of the north. This, which may be called the Iceland sheep, resembles our breed, in the form of the body and the tail; but differs in a very extraordinary manner in the number of the horns; being generally found to have four, and sometimes even eight, growing from different parts of the forehead. These are large and formidable; and the animal seems thus fitted by Nature for a state of war: however, it is of the nature of the rest of its kind, being mild, gentle, and timid. Its wool is very different, also, from that of the common sheep, being long, smooth, and hairy. Its colour is of a dark brown; and under its outward coat of hair, it has an internal covering, that rather resembles fur than wool, being fine, short, and soft.

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[*] Lisle's Husbandry, vol. ii. p. 155.
[†] Ibid.
[‡] Buffon, vol. xxiii. p. 163.
[§] Crantz.

The second variety to be found in this animal, is that of the broad-tailed sheep, so common in Tartary, Arabia, Persia, Barbary, Syria, and Egypt. This sheep is only remarkable for its large and heavy tail, which is often found to weigh from twenty to thirty pounds. It sometimes grows a foot broad, and is obliged to be supported by a small kind of board, that goes upon wheels. This tail is not covered underneath with wool, like the upper part, but is bare; and the natives, who consider it as a very great delicacy, are very careful in attending and preserving it from injury. Mr. Buffon supposes that the fat which falls into the caul in our sheep, goes in these to furnish the tail; and that the rest of the body is from thence deprived of fat in proportion. With regard to their fleeces, in the temperate climates, they are, as in our own breed, soft and woolly; but in the warmer latitudes, they are hairy: yet in both they preserve the enormous size of their tails.

The third observable variety is that of the sheep called *strepsicheros.* This animal is a native of the islands of the Archipelago, and only differs from our sheep, in having straight horns, surrounded with a spiral furrow.

The last variety is that of the Guinea sheep, which is generally found in all the tropical climates, both of Africa and the East-Indies. They are of a large size, with a rough, hairy skin, short horns, and ears hanging down, with a kind of dewlap under the chin. They differ greatly in form from the rest; and might be considered as animals of another kind, were they not known to breed with other sheep. These, of all the domestic kinds, seem to approach the nearest to the state of Nature. They are larger, stronger, and swifter than the common race; and, consequently, better fitted for the precarious forest life. However, they seem to rely, like the rest, on man for support; being entirely of a domestic nature, and subsisting only in the warmer climates.

Such are the varieties of this animal, which have been reduced into a state of domestic servitude. These are all capable of producing among each other; all the peculiarities of their form have been made by climate and human cultivation; and none of them seem sufficiently independent to live in a state of savage nature. They are, therefore, to be considered as a degenerate race, formed by the hand of man, and propagated merely for his benefit. At the same time, while man thus cultivates the domestic kinds, he drives away and destroys the savage race, which are less beneficial, and more headstrong. These, therefore, are to be found in but a very small number, in the most uncultivated countries, where they have been able to subsist by their native swiftness and strength. It is in the more uncultivated parts of Greece, Sardinia, Corsica, and particularly in the deserts of Tartary, that the moufflon is to be found, that bears all the marks of being the primitive race; and that has been actually known to breed with the domestic animal.

The moufflon, or musmon, though covered with hair, bears a stronger similitude to the ram, than to any other animal; like the ram it has the eyes placed near the horns; and its ears are shorter than those of the

Goat, p. 45.

Syrian Goat, p. 47.

Musmon, p. 44.

To face p. 45, vol. ii.

goat: it also resembles the ram in its horns, and in all the particular contours of its form. The horns also are alike; they are of a yellow colour; they have three sides, as in the ram, and bend backwards in the same manner behind the ears; the muzzle and the inside of the ears, are of a whitish colour, tinctured with yellow; the other parts of the face are of a brownish gray. The general colour of the hair over the body is of a brown, approaching to that of the red deer. The inside of the thighs and belly are of a white, tinctured with yellow. The form, upon the whole, seems more made for agility and strength than that of the common sheep; and the moufflon is actually found to live in a savage state, and maintain itself either by force or swiftness, against all the animals that live by rapine. Such is its extreme speed, that many have been inclined rather to rank it among the deer kind, than the sheep. But in this they are deceived, as the musmon has a mark that entirely distinguishes it from that species, being known never to shed its horns. In some these are seen to grow to a surprising size; many of them measuring, in their convolutions, above two ells long. They are of a yellow colour, as was said; but the older the animal grows, the darker the horns become; with these they often maintain very furious battles between each other; and sometimes they are found broken off in such a manner, that the small animals of the forest creep into the cavity for shelter.* When the musmon is seen standing on the plain, his fore-legs are always straight, while his hinder-legs seem bent under him; but in cases of more active necessity, this seeming deformity is removed, and he moves with great swiftness and agility. The female very much resembles the male of this species, but that she is less, and her horns also are never seen to grow to that prodigious size they are of in the wild ram. Such is the sheep in its savage state; a bold, noble, and even beautiful animal: but it is not the most beautiful creatures that are always found most useful to man. Human industry has therefore destroyed its grace, to improve its utility.

THE GOAT,

AND ITS NUMEROUS VARIETIES.

There are some domestic animals that seem as auxiliaries to the more useful sorts; and, that by ceasing to be the first, are considered as nothing. We have seen the services of the ass slighted, because inferior to those of the horse; and, in the same manner, those of the goat are held cheap, because the sheep so far exceeds it. Were the horse or the sheep removed from Nature, the inferior kinds would then be invaluable; and the same arts would probably be bestowed in perfecting their kinds, that the higher order of animals have experienced. But in their present neglected state, they vary but little from the wild animals of the same kind; man has left them their primitive habits and forms; and the less they owe to his assiduity, the more they receive from Nature.

The goat seems, in every respect, more fitted for a life of savage liberty than the sheep.† It is naturally more lively, and more possessed with animal instinct. It easily attaches itself to man, and seems sensble of his caresses. It is also stronger and swifter, more courageous, and more playful, lively, capricious, and vagrant: it is not easily confined to its flock, but chooses its own pastures, and loves to stray remote from the rest. It chiefly delights in climbing precipices; in going to the very edge of danger: it is often seen suspended upon an eminence hanging over the sea, upon a very little base, and even sleeps there in security. Nature has, in some measure, fitted it for traversing these declivities with ease; the hoof is hollow underneath, with sharp edges, so that it walks as securely on the ridge of a house, as on the level ground. It is a hardy animal, and very easily sustained; for which reason it is chiefly the property of the poor, who have no pastures with which to supply it. Happily, however, it seems better pleased with the neglected wild, than the cultivated fields of Art; it chooses the heathy mountain, or the shrubby rock; its favourite food is the tops of the boughs, or the tender bark of young trees; it seems less afraid of immoderate heat, and bears the warm climates, better than the sheep; it sleeps exposed to the sun; and seems to enjoy its warmest fervours; neither is it terrified at the storm, or incommoded by the rain; immoderate cold alone seems to affect it, and is said to produce a vertigo, with which this animal is sometimes incommoded. The inconstancy of its nature is perceivable in the irregularity of its gait; it goes forward, stops, runs, approaches, flies, merely from caprice, and with no other seeming reason than the extreme vivacity of its disposition.

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* Gmelin, as quoted by Buffon. † Buffon.

There are proofs of this animal's being naturally the friend of man; and that the goat seldom resumes its primæval wildness, when once reduced into a state of servitude. In the year 1698, an English vessel happening to touch at the islands of Bonavista, two Negroes came, and offered the sailors as many goats as they chose to take away. Upon the captain's expressing his astonishment at this offer, the Negroes assured him that there were but twelve persons in the island, and that the goats were multiplied in such a manner as even to become a nuisance: they added, that instead of giving any trouble to catch them, they followed the few inhabitants that were left with a sort of obstinacy, and rather became importunate with their tameness.

The goat produces but two at a time; and three at the most. But in the warmer climates, although the animal degenerates, and grows less, yet it becomes more fruitful, being generally found to bring forth three, four, and five at a single delivery. The buck is capable of propagating at the age of one year, and the female at seven months; however, the fruits of this premature generation are weak and defective; and their best breeding-time is generally delayed till the age of two years, or eighteen months at least. One buck is sufficient for a hundred and fifty goats; his appetites are excessive: but this ardour brings on a speedy decay, so that he is enervated in four years at most, and even becomes old before he reaches his seventh year. The goat, like the sheep, continues five months with young; and, in some places, bears twice a year.

The milk of the goat is sweet, nourishing, and medicinal; not so apt to curdle upon the stomach as that of the cow; and, therefore, preferable to those whose digestion is but weak. The peculiarity of this animal's food, gives the milk a flavour different from that either of the cow or the sheep; for as it generally feeds upon shrubby pastures, and heathy mountains, there is an agreeable wildness in the taste, very pleasing to such as are fond of that aliment. In several parts of Ireland, and the highlands of Scotland, the goat makes the chief possession of the inhabitants. On those mountains, where no other useful animal could find subsistence, the goat continues to glean a sufficient living, and supplies the hardy natives with what they consider as varied luxury. They lie upon beds made of their skins, which are soft, clean, and wholesome; they live upon their milk, with oat bread; they convert a part of it into butter, and some into cheese; the flesh, indeed, they seldom taste of, as it is a delicacy which they find too expensive; however, the kid is considered, even by the city epicure, as a great rarity; and the flesh of the goat, when properly prepared, is ranked by some as no way inferior to venison. In this manner, even in the wildest solitudes, the poor find comforts of which the rich do not think it worth their while to dispossess them: in these mountainous retreats, where the landscape presents only a scene of rocks, heaths, and shrubs, that speak the wretchedness of the soil, these simple people have their feasts and their pleasures, their faithful flocks of goats attend them to these awful solitudes, and furnishe them with all the necessaries of life; while their remote situation happily keeps them ignorant of greater luxury.

As these animals are apt to stray from the flock, no man can attend above fifty of them at a time. They are fattened in the same manner as sheep; but, taking every precaution, their flesh is never so good or so sweet, in our climate, as that of mutton. It is otherwise between the tropics. The mutton there becomes flabby and lean, while the flesh of the goat rather seems to improve; and in some places the latter is cultivated in preference to the former. We, therefore, find this animal in almost every part of the world, as it seems fitted for the necessities of man in both extremes. Towards the north, where the pasture is coarse and barren, the goat is fitted to find a scanty subsistence; between the tropics, where the heat is excessive, the goat is fitted to bear the climate, and its flesh is found to improve.

One of the most remarkable varieties we find in the goat is in that of Natolia. The Natolian goat, or, as Mr. Buffon calls it, the goat of *Angora*, has the ears longer than ours, and broader in proportion. The male has horns of about the same length with the goat of Europe, but black, and turned very differently, going out horizontally on each side of the head, and twisted round in the manner of a cork-screw. The horns of the female are shorter, and encircle the ear somewhat like those of the ram. They are of a dazzling white colour, and in all the hair is very long, thick, fine, and glossy; which, indeed, is the case with almost all the animals of Syria. There are a great number of these animals about Angora, where the inhabitants drive a trade with their hair, which is sold either raw, or manufactured, into all parts of Europe. Nothing can exceed the beauty of the stuffs which are made from the hair of almost all the animals of that country. These are well known among us by the name of *camblet*.

A second variety is the Assyrian goat of Gesner, which is somewhat larger than ours, with ears almost hanging down to the ground, and broad in proportion. The horns, on the contrary, are not above two inches and a half long, black, and bending a little backwards. The hair is of a fox colour, and under the throat there are two excrescences, like the gills of a cock. These animals are chiefly kept round Aleppo for the sake of their milk. They are driven through the streets, and their milk is sold to the inhabitants as they pass along.

In the third variety may be reckoned the little goat of America, which is of the size of a kid, but the hair is as long as that of the ordinary breed. The horns, which do not exceed the length of a man's finger, are thick, and bend downwards so close to the head, that they almost enter the skin.

There is an animal of this kind at the Cape of Good Hope, called the *blue goat*, which may be ranked as the fourth variety. It is in shape like the domestic, but much larger, being nearly of the size of a stag. Its hair is very short, and of a delightful blue; but it loses a great deal of its beauty when the animal is dead. It has a very long beard; but the horns are not so long in proportion as in other goats, being turned spirally, in the manner of a cork-screw. It has very long legs, but well proportioned; and the flesh is very well tasted, but lean. For this reason, in that plentiful country, it is chiefly killed upon account of its skin. It is a very shy animal, and seldom comes near the Dutch settlements; but they are found in great abundance in the more uncultivated parts of the country. Besides these, they are found in this extensive region of various colours, and many of them are spotted beautifully, with red, white, and brown.

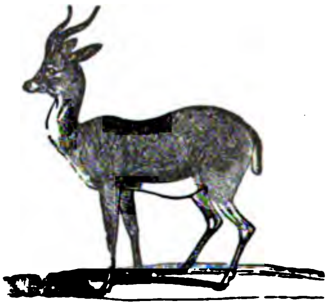
In fine, the Juda goat resembles ours in most parts, except in size, it being much smaller. This animal is common in Guinea, Angola, and all along the coast of Africa; it is not much larger than the hare, but it is extremely fat, and its flesh admirably tasted. It is in that country universally preferred to mutton.

These animals seem all of one kind, with very trifling distinctions between them. It is true that they differ in some respects; such as having neither the same colour, hair, ears, or horns. But it ought to be considered as a rule in natural history, that neither the horns, the colour, the fineness or the length of the hair, nor the position of the ears, are to be considered as making an actual distinction in the kinds. These are accidental varieties, produced by climate and food, which are known to change even in the same animal, and give it a seeming difference of form. When we see the shapes, the inclinations, and the internal conformation of seemingly different creatures nearly the same; and, above all, when we see them producing among each other, we then have no hesitation in pronouncing the species, and asserting that these are of the goat kind, with which they are so materially connected.

But, although these are evidently known to belong to the goat kind, there are others nearly resembling the goat, of whose kindred we cannot be equally certain. These are such as being found in a state of nature, have not as yet been sufficiently subjected to human observation. Hence it is impossible to determine with precision to which class they belong; whether they be animals of a particular kind, or merely the goat in its state of savage freedom. Were there but one of these

Chamois, p. 49.

Ibex, p. 49.



Antelope, or Gazelle, p. 32.

Red Deer, p. 60.

Fallow Deer, p. 72.

To face p. 49. vol. ii.

Persian Sheep, p. 44

Gnu Antelope, or Bubalus, p. 55.

Nyl Ghau, p. 11, vol. iii.

To face p. 49, vol. ii.

wild animals, the inquiry would soon be ended; and we might readily allow it for the parent stock; but, in the present case, there are two kinds that have almost equal pretensions to this honour; and the claims of which it has been found difficult to determine. The animals in question are the chamois and the ibex. These both bear very near approaches to the goat in figure; have horns that never shed; and, at the same time, are more different from each other than from the animal in question. From which of these two sources our domestic goat is derived, is not easy to settle. Instead, therefore, of entering into the discussion, I will content myself with the result of Mr. Buffon's inquiries. He is of opinion that the ibex is the principal source; that our domestic goat is the immediate descendant; and that the chamois is but a variety from that stock, a sort of collateral branch of the same family. His principal reason for giving the preference to the ibex, is its having a more masculine figure, large horns, and a large beard; whereas the chamois wants those marks of primitive strength and wildness. He supposes, therefore, in their original savage state, that our goat has taken after the male of the parent stock, and the chamois after the female; and that this has produced a variety in these animals, even before they underwent human cultivation.

However this be, the two animals in question seem both well fitted for their precarious life, being extremely swift, and capable of running with ease along the ledges of precipices, where even the wolf or the fox, though instigated by hunger, dare not pursue them. They are both natives of the Alps, the Pyrenees, and the mountains of Greece; there they propagate in vast numbers, and continue to exist in spite of the hunter and every beast of prey that is found incessantly to pursue them.

The ibex resembles the goat in the shape of its body; but differs in the horns, which are much larger. They are bent backward, full of knots; and it is generally asserted that there is a knot added every year. There are some of these found, if we believe Bellonius, at least two yards long. The ibex has a large, black beard, is of a brown colour, with a thick, warm coat of hair. There is a streak of black runs along the top of the back; and the belly and back of the thighs are of a fawn colour.

The chamois,* though a wild animal, is very easily tamed, and docile; and to be found only in rocky and mountainous places. It is about the size of a domestic goat, and resembles one in many respects. It is most agreeably lively, and active beyond expression. The chamois' hair is short, like that of the doe; in spring it is of an ash colour, in autumn a dun colour, inclining to black, and in winter of a blackish brown. This animal is found in great plenty in the mountains of Dauphiny, of Piedmont, Savoy, Switzerland, and Germany. They are peaceful, gentle creatures, and live in society with each other. They are found in flocks of from four to fourscore, and even a hundred, dispersed upon the crags of the mountains. The large males are seen feeding detached from the rest, except in rutting time, when they approach the females, and drive away the young. The time of their coupling is from the beginning of

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* Mr. Peroud's Account, as quoted by Buffon.

September to the end of October; and they bring forth in April and March. The young keeps with the dam for about five months, and sometimes longer, if the hunters and the wolves do not separate them. It is asserted that they live between twenty and thirty years. Their flesh is good to eat; and they are found to have ten or twelve pounds of suet, which far surpasses that of the goat in hardness and goodness. The chamois has scarce any cry, as most animals are known to have; if it has any, it is a kind of feeble bleat, by which the parent calls its young. But in cases of danger, and when it is to warn the rest of the flock, it uses a hissing noise, which is heard at a great distance. For it is to be observed, that this creature is extremely vigilant, and has an eye the quickest and most piercing in Nature. Its smell also is not less distinguishing. When it sees its enemy distinctly, it stops for a moment; and then, if the person be near, in an instant after it flies off. In the same manner, by its smell, it can discover a man at half a league distance, and gives the earliest notice. Upon any alarm, therefore, or any apprehensions of danger, the chamois begins his hissing note with such force, that the rocks and the forests re-echo to the sound. The first hiss continues as long as the time of one inspiration. In the beginning it is very sharp, and deeper towards the close. The animal having, after this first alarm, reposed a moment, again looks round, and, perceiving the reality of its fears, continues to hiss by intervals, until it has spread the alarm to a very great distance. During this time, it seems in the most violent agitation; it strikes the ground with its fore-foot, and sometimes with both: it bounds from rock to rock; it turns and looks round; it runs to the edge of the precipice; and, still perceiving the enemy, flies with all its speed. The hissing of the male is much louder and sharper than that of the female; it is performed through the nose; and is properly no more than a very strong breath driven violently through a small aperture. The chamois feeds upon the best herbage, and chooses the most delicate parts of the plants, the flower and the tender buds. It is not less delicate with regard to several aromatic herbs which grow upon the sides of the mountains. It drinks but very little while it feeds upon the succulent herbage, and chews the cud in the intervals of feeding. This animal is greatly admired for the beauty of its eyes, which are round and sparkling, and which mark the warmth of its constitution. Its head is furnished with two small horns, of about half a foot long, of a beautiful black, and rising from the forehead, almost betwixt the eyes. These, contrary to what they are found in other animals, instead of going backwards or sideways, jet out forward, and bend a little, at their extremities, backward, in a small circle, and end in a very sharp point. The ears are placed, in a very elegant manner, near the horns; and there are two stripes of black on each side of the face, the rest being of a whitish yellow, which never changes. The horn of this animal is often used as the head of a cane. Those of the female are less, and not so much bent; and some farriers are seen to bleed cattle with them. These animals are so much incommoded by heat, that they are never found in summer, except in the caverns of rocks, amidst fragments of unmelted ice, under the shade of high and spreading trees, or of rough and hanging precipices, that face the north, and which keep off entirely the rays of the sun. They go to pasture both morning and evening, and seldom during the heat of the day. They run along the rocks with great ease and seeming indifference, and leap from one to another, so that no dogs are able to pursue them. There is nothing more extraordinary than to see them climbing, and descending precipices, that to all other quadrupeds are inaccessible. They always mount or descend in an oblique direction; and throw themselves down a rock of thirty feet, and light with great security upon some excrescence or fragment, on the side of the precipice, which is just large enough to place their feet upon; they strike the rock, however, in their descent, with their feet three or four times, to stop the velocity of their motion; and, when they have got upon their base below, they at once seem fixed and secure. In fact, to see them jump in this manner, they seem rather to have wings than legs: some, indeed, pretend to say, that they use their horns for climbing, but this wants confirmation. Certain it is that their legs alone are formed for this arduous employment, the hinder being rather longer than the former, and bending in such a manner, that when they descend upon them, they break the force of the fall. It is also asserted, that when they feed, one of them always stands as centinel; but how far this may be true is questionable. For certain,/while they feed, there are some of them that keep continually grazing round the rest; but this is practised among all gregarious animals: so that when they see any danger, they warn the rest of the herd of its approach. During the rigours of winter, the chamois sleeps in the thicker forests, and feeds upon the shrubs and the buds of the pine-tree. It sometimes turns up the snow with its foot to look for herbage, and where it is green, makes a delicious repast. The more craggy and uneven the forest, the more this animal is pleased with the abode, which thus adds to its security. The hunting the chamois is very laborious, and extremely difficult. The most usual way is to hide behind the clefts of the rocks and shoot them. This, however, must be done with great precaution; the sportsman must creep for a vast way upon his belly, in silence, and take also the advantage of the wind, which if it blow from him they would instantly perceive. When arrived at a proper distance, he then advances his piece, which is to be rifle-barrelled, and to carry one ball, and tries his fortune among them. Some also pursue this animal, as they do the stag, by placing proper persons at all the passages of a glade or valley, and then sending in others to rouze the game. Dogs are quite useless in this chase, as they rather alarm than overtake. Nor is it without danger even to the men; for it often happens that when the animal finds itself over-pressed, it drives at the hunter with its head, and often tumbles him down the neighbouring precipice. This animal cannot go upon ice when smooth; but if there be the least inequalities on its surface, it then bounds along in security, and quickly evades all pursuit.

The skin of the chamois was once famous, when tanned, for its softness and warmth; at present, however, since the art of tanning has been brought to greater perfection, the leather called *chamois* is made also from those of the tame goat, the sheep, and the deer. Many medicinal virtues also were said to reside in the blood, fat, gall, and the concretion sometimes found in the stomach of this animal, called the

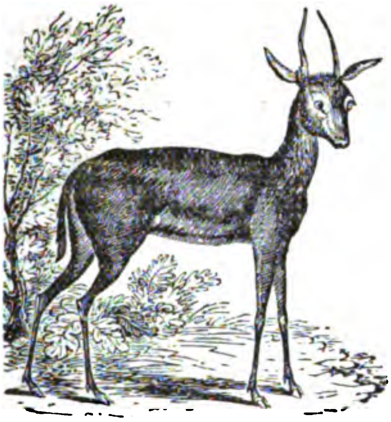
German bezoar. The fat, mixed with milk, was said to be good in ulcers of the lungs. The gall was said to be useful in strengthening the sight; the stone, which is generally about the size of a walnut, and blackish, was formerly in great request for having the same virtues with oriental bezoar. However, in the present enlightened state of physic, all these medicines are quite out of repute; and although we have the names of several medicines procurable from quadrupeds, yet, except the musk or hartshorn alone, I know of none in any degree of reputation. It is true, the fat, the urine, the beak, and even the dung of various animals, may be found efficacious, where better remedies are not to be had; but they are far surpassed by many at present in use, whose operations we know, and whose virtues are confirmed by repeated experience.

Such are the quadrupeds that more peculiarly belong to the goat kind. Each of these, in all probability, can engender and breed with the other; and were the whole race extinguished, except any two, these would be sufficient to replenish the world, and continue the kind. Nature, however, proceeds in her variations by slow and insensible degrees, and scarce draws a firm, distinguished line between any two neighbouring races of animals whatsoever. Thus it is hard to discover where the sheep ends, and the goat begins; and we shall find it still harder to fix precisely the boundaries between the goat kind and the deer. In all transitions from one kind to the other, there are found to be a middle race of animals, that seem to partake of the nature of both, and that can precisely be referred to neither. That race of quadrupeds, called the *gazelles*, are of this kind; they are properly neither goat nor deer, and yet they have many of the marks of both; they make the shade between these two kinds, and fill up the chasm in Nature.

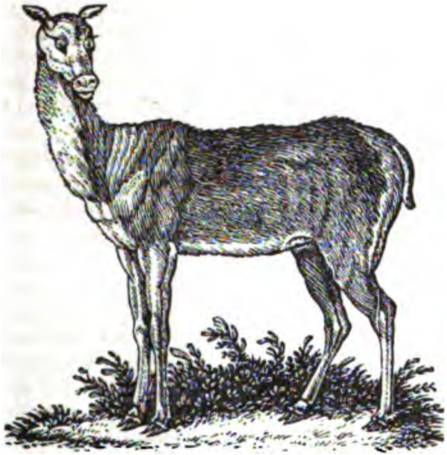
THE GAZELLES.

The Gazelles, of which there are several kinds, can, with propriety, be referred neither to the goat nor the deer; and yet they partake of both natures. Like the goat, they have hollow horns that never fall, which is otherwise in the deer. They have a gall-bladder, which is found in the goat and not in the deer; and, like that animal, they feed rather upon shrubs than grassy pasture. On the other hand, they resemble the roebuck in size and delicacy of form; they have deep pits under the eyes like that animal; they resemble the roebuck in the colour and nature of their hair; they resemble him in the bunches upon their legs, which only differ in being upon the fore-legs in these, and on the hind-legs in the other. They seem, therefore, to be of a middle nature between these two kinds; or, to speak with greater truth and precision, they form a distinct kind by themselves.

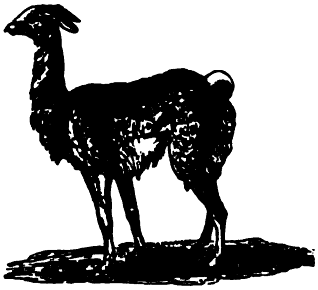
The distinguishing marks of this tribe of animals, by which they differ both from the goat and the deer, are these: their horns are made differently, being annulated or ringed round, at the same time that there are longitudinated depressions running from the bottom to the point. They have bunches of hair upon their fore-legs; they have a streak of black, red, or brown, running along the lower part of their sides, and three streaks of whitish hair in the internal side of the ear. These are characters that none of them are without; besides these, there are others



Codous, or Indian Antelope, p. 53.



The Hind, or Female Red Deer, p. 65.



Lama, p. 9, vol. iii.

Axis Deer, p 71.

To face p. 52, vol. ii.

German bezoar. The fat, mixed with milk, was said to be good in ulcers of the lungs. The gall was said to be useful in strengthening the sight; the stone, which is generally about the size of a walnut, and blackish, was formerly in great request for having the same virtues with oriental bezoar. However, in the present enlightened state of physic, all these medicines are quite out of repute; and although we have the names of several medicines procurable from quadrupeds, yet, except the musk or hartshorn alone, I know of none in any degree of reputation. It is true, the fat, the urine, the beak, and even the dung of various animals, may be found efficacious, where better remedies are not to be had; but they are far surpassed by many at present in use, whose operations we know, and whose virtues are confirmed by repeated experience.

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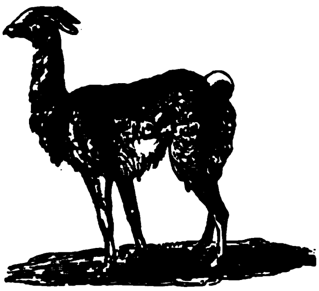
Cudous, or Indian Antelope, p. 55.

The Hind, or Female Red Deer, p. 65.



Lama, p. 9, vol. iii.

Axis Deer, p 71.

To face p. 52, vol. ii.

which, in general, they are found to have, and which are more obvious to the beholder. Of all animals in the world, the gazelle has the most beautiful eye, extremely brilliant, and yet so meek, that all the eastern poets compare the eyes of their mistresses to those of this animal. A gazelle-eyed beauty is considered as the highest compliment that a lover can pay; and, indeed, the Greeks themselves thought it no inelegant piece of flattery to resemble the eyes of a beautiful woman to those of a cow. The gazelle, for the most part, is more delicately and finely limbed than even the roebuck; its hair is as short, but finer, and more glossy. Its hinder legs are longer than those before, as in the hare, which gives it greater security, in ascending or descending steep places. Their swiftness is equal, if not superior, to that of the roe; but as the latter bounds forward, so these run along in an even uninterrupted course. Most of them are brown upon the back, white under the belly, with a black stripe separating those colours between. Their tail is of various lengths, but in all covered with pretty long hair; and their ears are beautiful, well-placed, and terminating in a point. They all have a cloven hoof, like the sheep; they all have permanent horns; and the female has them smaller than the male.

Of these animals, Mr. Buffon makes twelve varieties; which, however, is much fewer than what other naturalists have made them. The first is the *gazella*, properly so called, which is of the size of the roe-buck, and very much resembling it in all the proportions of its body, but entirely differing, as was said, in the nature and fashion of the horns, which are black and hollow, like those of the ram or the goat, and never fall. The second he calls the *kevel*, which is rather less than the former; its eyes also seem larger; and its horns, instead of being round, are flatted on the sides, as well in the male as the female. The third he calls the *corin*, which very much resembles the two former, but that it is still less than either. Its horns also are smaller in proportion, smoother than those of the other two, and the annular prominences belonging to the kind are scarce discernible, and may be rather called wrinkles than prominences. Some of these animals are often seen streaked like the tiger. These three are supposed to be of the same species. The fourth he calls the *zeiran*, the horns only of which he has seen; which, from their size, and the description of travellers, he supposes to belong to a larger kind of the gazelle, found in India and Persia, under that denomination.

The fifth he calls the *koba*, and the sixth the *kob*; these two differ from each other only in size, the former being much larger than the latter. The muzzle of these animals is much longer than those of the ordinary gazelle; the head is differently shaped, and they have no depressions under the eyes. The seventh he calls after its Egyptian name, the *algazel*; which is shaped pretty much like the ordinary gazelle, except that the horns are much longer, being generally three feet from the point to the insertion; whereas, in the common gazelle, they are not above a foot; they are smaller also, and straighter, till near the extremities, when they turn short, with a very sharp flexure: they are black and smooth, and the annular prominences are scarcely observable. The eighth is called the *pazan*; or, by some, the *bezoar goat*, which greatly resembles the former, except a small variety in their horns; and also with this difference, that as the algazel feeds upon the plains, this is only found in the mountains. They are both inhabitants of the same countries and climates; being found in Egypt, Arabia, and Persia. This last is the animal famous for that concretion in the intestines or stomach, called the *oriental bezoar*, which was once in such repute all over the world for its medicinal virtues. The word *bezoar* is supposed to take its name either from the pazan or pazar, which is the animal that produces it; or from a word in the Arabic language, which signifies *antidote* or *counter-poison*. It is a stone of a glazed blackish colour, found in the stomach, or the intestines of some animal, and brought over to us from the East-Indies. Like all other animal concretions, it is found to have a kind of nucleus, or hard substance within, upon which the external coatings were formed; for, upon being sawed through, it is seen to have layer over layer, as in an onion. This nucleus is of various kinds; sometimes the buds of a shrub, sometimes a piece of stone, and sometimes a marcasite. This stone is from the size of an acorn to that of a pigeon's egg; the larger the stone, the more valuable it is held; its price increasing, like that of a diamond. There was a time when a stone of four ounces sold in Europe for above two hundred pounds; but, at present, the price is greatly fallen, and they are in very little esteem. The bezoar is of various colours; sometimes of a blood colour, sometimes of a pale yellow, and of all the shades between these two. It is generally glossy, smooth, and has a fragrant smell, like that of ambergris, probably arising from the aromatic vegetables upon which the animal that produces it feeds. It has been given in vertigoes, epilepsies, palpitations of the heart, colic, jaundice; and in those places, where the dearness and not the value of medicines is consulted, in almost every disorder incident to man. In all, perhaps, it is equally efficacious, acting only as an absorbent powder, and possessing virtues equal to common chalk, or crabs-claws. Judicious physicians have therefore discarded it; and this celebrated medicine is now chiefly consumed in countries where the knowledge of Nature has been but little advanced. When this medicine was in its highest reputation, many arts were used to adulterate it; and many countries endeavoured to find out a bezoar of their own. Thus we had Occidental bezoar, brought from America; German bezoar, which has been mentioned before; cow bezoar, and monkey bezoar. In fact, there is scarce an animal, except of the carnivorous kinds, that does not produce some of these concretions in the stomach, intestines, kidneys, bladder, and even in the heart. To these ignorance may impute virtues that they do not possess; experience has found but few cures wrought by their efficacy; but it is well known, that they often prove fatal to the animal that bears them. Those concretions are generally found in cows, by their practice of licking off their hair, which gathers in the stomach into the shape of a ball, acquires a surprising degree of hardness, and sometimes a polish like leather. They are often as large as a goose-egg: and when become too large to pass, block up the passage of the food, and the animal dies. The substance of these balls, however, is different from the bezoar mentioned above; being rather a concertion of hair than of stone. There is a bezoar found in the gall-bladder of a boar, and thence called *hog bezoar*, in very great esteem; but perhaps with as little justice as any of the former. In short, as we have already observed, there is scarce an animal, or scarce a part of their bodies, in which concretions are not formed; and it is more than probable, as Mr. Buffon justly remarks, that the bezoar so much in use formerly, was not the production of the pazar, or any one animal only, but that of the whole gazelle kind: who feeding upon odoriferous herbs and plants, gave this admirable fragrance to the accidental concretions which they were found to produce. As this medicine, however, is but little used at present, our curiosity is much abated as to the cause of its formation. To return, therefore, to the varieties in the gazelle tribe, the ninth is called the *ranguer*, and is a native of Senegal. This differs somewhat in shape and colour from the rest; but particularly in the shape of its horns, which are straight near to the points, where they crook forward, pretty much in the same manner as in the chamois they crook backward. The tenth variety of the gazelle is the *antelope*, so well known to the English, who have given it the name. This animal is of the size of a roe-buck, and resembles the gazelle in many particulars, but differs in others: it has deeper eye-pits than the former; the horns are formed differently also, being about sixteen inches long, almost touching each other at the bottom, and spreading as they rise, so as at their tips to be sixteen inches asunder. They have the annual prominences of their kind, but not so distinguishable as in the gazelle: however, they have a double flexure, which is very remarkable, and serves to distinguish them from all others of their kind. At the root they have a tuft of hair, which is longer than that of any part of the body. Like others of the same kind, the antelope is brown on the back, and white under the belly; but these colours are not separated by the black streak which is to be found in all the rest of the gazelle kinds. There are different sorts of this animal, some with larger horns than others, and others with less. The one which makes the eleventh variety in the gazelle kind, Mr. Buffon calls the *lidme*, which has very long horns; and the other, which is the twelfth and last, he calls the *Indian antelope*, the horns of which are very small.

To these may be added three or four varieties more, which is not easy to tell whether to refer to the goat or the gazelle, as they equally resemble both. The first of these is the *bubalus*, an animal that seems to partake of the mixed natures of the cow, the goat, and the deer. It resembles the stag in the size and the figure of its body, and particularly in the shape of its legs. But it has permanent horns, like the goat; and made entirely like those of the gazelle kind. It also resembles that animal in its way of living: however, it differs in the make of its head, being exactly like the cow in the length of its muzzle, and in the disposition of the bones of its skull; from which similitude it has taken its name. This animal has a narrow long head; the eyes are placed very high; the forehead short and narrow; the horns permanent, about a foot long, black, thick, annulated, and the rings of the gazelle kind, remarkably large; its shoulders are very high, and it has a kind of bunch on them, that terminates at the neck; the tail is about a foot long, and tufted with hair at the extremity. The hair of this animal is remarkable in being thicker at the middle than at the root: in all other quadrupeds, except the elk and this, the hair tapers off from the bottom to the point but in these, each hair seems to swell in the middle, like a nine-pin. The bubalus also resembles the elk in size, and the colour of its skin; but these are the only similitudes between them: as the one has a very large branching head of solid horns that are naturally deciduous, the other has black unbranching hollow horns that never fall. The bubalus is common enough in Barbary, and has often been called by the name of the *Barbary cow*, from which animal it differs so widely. It partakes pretty much of the nature of the antelope; like that having the hair short, the hide black, the ears pointed, and the flesh good for food.

The second anomalous animal of the goat-kind, Mr. Buffon calls the *condoma*. It is supposed to be equal in size to the largest stag, but with hollow horns, like those of the goat kind, and with varied flexures, like those of the antelope. They are above three feet long; and at their extremities about two feet asunder. All along the back there runs a white list, which ends at the insertion of the tail; another of the same colour crosses this, at the bottom of the neck, which it entirely surrounds: there are two more of the same kind running round the body, one behind the fore-legs and the other running parallel to it before the hinder. The colour of the rest of the body is grayish, except the belly, which is white: it has also a long gray beard; and its legs, though long, are well proportioned.

The third that may be mentioned, he calls the *guiba*. It resembles the gazelles in every particular, except in the colour of the belly, which, as we have seen, is white in them, but in this is of a deep brown. Its horns also are not marked with annual prominences, but are smooth and polished. It is also remarkable for white lists, on a brown ground, that are disposed along the animal's body, as if it were covered with harness. Like the former it is a native of Africa.

The *African wild goat* of Grimmius is the fourth. It is of a dark ash-colour; and in the middle of the head is a hairy tuft, standing upright; on both sides, between the eyes and the nose, there are very deep cavities, greater than those of the other kinds, which contain a yellow oily liquor, which coagulates into a black substance, that has a smell between musk and civet. This being taken away, the liquor again runs out and coagulates, as before. These cavities have no communication with the eyes, and, consequently, this oozing substance can have nothing of the nature of tears.

To this we may add the *chevrotin*, or litle Guinea deer, which is the least of all cloven footed quadrupeds, and perhaps the most beautiful; its legs, at the smallest part, are not much thicker than the shank of a tobacco-pipe; it is about seven inches high, and about twelve from the point of the nose to the insertion of the tail. It is the most delicately shaped animal in the world, being completely formed like a stag in miniature; except that its horns, when it has any, are more of the gazelle kind, being hollow and annulated in the same manner. It has two canine teeth in the upper jaw; in which respect it differs from all other animals of the goat or deer kind, and thus makes a species entirely distinct by itself. This wonderful animal's colour is not less pleasing; the hair, which is short and glossy, being in some of a beautiful yellow, except on the neck and belly, which is white. They are natives of India, Guinea, and the warm climates between the tropics.

White Lama, p. 9, vol. iii.

Strepsiceros, p. 44.

Urus, p. 32.

To face p. 56, vol. ii.

and are found in great plenty. But though they are amazingly swift for their size, yet the Negroes often overtake them in the pursuit, and knock them down with their sticks. They may be easily tamed, and then they become familiar and pleasing; but they are of such delicate constitutions, that they can bear no climate but the hottest; and they always perish with the rigours of ours, when they are brought over. The male in Guinea has horns: the female is without any; as are all the kinds of this animal, to be found either in Java or Ceylon, where they chiefly abound.

Such is the list of the gazelles; all which pretty nearly resemble the deer in form and delicacy of shape; but have the horns hollow, single, and permanent, like those of the goat. They properly fill up, as has been already observed, the interval between these two kinds of animals; so that it is difficult to tell where the goat ends, and the deer may be said to begin. If we compare the gazelles with each other, we shall find but very slight distinctions between them. The turn or the magnitude of the horns, the different spots on the skin, or a difference of size in each, are chiefly the marks by which their varieties are to be known; but their way of living, their nature, and their peculiar swiftness, all come under one description.

The gazelles are, in general, inhabitants of the warmer climates; and contribute, among other embellishments, to add beauty to those forests that are for ever green. They are often seen feeding in herds, on the sides of the mountain, or in the shade of the woods; and fly all together, upon the smallest approaches of danger. They bound with such swiftness, and are so very shy, that dogs or men vainly attempt to pursue them. They traverse those precipices with ease and safety, which to every quadruped else are quite impracticable; nor can any animals but of the winged kind overtake them. Accordingly, in all those countries where they are chiefly found, they are pursued by falcons; and this admirable manner of hunting makes one of the principal amusements of the upper ranks of people all over the East. The Arabians, Persians, and Turks, breed up for this purpose, that kind of hawk called the *falcon gentle*, with which, when properly trained, they go forth on horseback among the forests and the mountains, the falcon perching upon the hand of the hunter. Their expedition is conducted with profound silence; their dogs are taught to hang behind; while the men, on the fleetest coursers, look round for the game. Whenever they spy a gazelle at the proper distance, they point the falcon to its object, and encourage it to pursue. The falcon, with the swiftness of an arrow, flies to the animal, that, knowing its danger, endeavours, but too late, to escape. The falcon soon coming up with its prey, fixes its talons, one into the animal's cheek, the other into its throat, and deeply wounds it. On the other hand, the gazelle attempts to escape, but is generally wounded too deep to run far. The falcon clings with the utmost perseverance, nor ever leaves its prey till it falls; upon which the hunters from behind approaching, take up both, and reward the falcon with the blood of the spoil. They also teach the young ones by applying them to the dead animal's throat, and accustoming them betimes to fix upon that particular part; for if it should happen that the falcon fixed upon any other part of the gazelle, either its back or its haunches, the animal would easily escape among the mountains, and the hunter would also lose his falcon. They sometimes also hunt these animals with the ounce. This carnivorous and fierce creature being made tame and domestic, generally sits on horseback behind the hunter, and remains there with the utmost composure, until the gazelle is shown; it is then that it exerts all its arts and fierceness: it does not at once fly at its prey, but approaches slyly, turning and winding about until it comes within the proper distance, when all at once it bounds upon the heedless animal, and instantly kills it, and sucks its blood. If, on the other hand, it misses its aim, it rests in its place, without attempting to pursue any farther, but seems ashamed of its own inability.

There is still another way of taking the gazelle, which seems not so certain, nor so amusing as either of the former. A tame gazelle is bred up for this purpose, who is taught to join those of its kind, wherever it perceives them. When the hunter, therefore, perceives a herd of these together, he fixes a noose round the horns of the tame gazelle in such a manner, that if the rest but touch it, they are entangled; and thus prepared, he sends his gazelle among the rest. The tame animal no sooner approaches, but the males of the herd instantly sally forth to oppose him; and, in butting with their horns, are caught in the noose. In this, both struggling for some time, fall together to the ground; and, at last, the hunter coming up, disengages the one and kills the other. Upon the whole, however, these animals, whatever be the arts used to pursue them, are very difficult to be taken. As they are continually subject to alarms from carnivorous beasts, or from man, they keep chiefly in the most solitary and inaccessible places, and find their only protection from situations of the greatest danger.

CHAPTER IV.

OF THE MUSK ANIMAL.

THE more we search into Nature, the more we shall find how little she is known; and we shall more than once have occasion to find, that protracted inquiry is more apt to teach us modesty, than to produce information. Although the number and nature of quadrupeds at first glance seems very well known; yet, when we come to examine closer, we find some with which we are very partially acquainted, and others that are utterly unknown. There is scarce a cabinet of the curious but what has the spoils of animals, or the horns or the hoofs of quadrupeds, which do not come within former descriptions. There is scarce a person whose trade is to dress or improve furs, but knows several creatures by their skins, which no naturalist has hitherto had notice of. But of all quadrupeds, there is none so justly the reproach of natural historians, as that which bears the musk. This perfume, so well known to the elegant, and so very useful in the hands of the physician; a medicine that has for more than a century been imported from the East in great quantities, and during all that time has been improving in its reputation, is, nevertheless, so very little understood, that it remains doubt whether the animal that produces it be a hog, an ox, a goat, or deer. When an animal with which we are so nearly connected, is so tterly unknown, how little must we know of many that are more remote nd unserviceable! Yet naturalists proceed in the same train, enlarging heir catalogues and their names, without endeavouring to find out the ature, and fix the precise history of those with which we are very artially acquainted. It is the spirit of the scholars of the present age o be fonder of increasing the bulk of our knowledge, than its utility; f extending their conquests, than of improving their empire.

The musk which comes to Europe, is brought over in small bags, bout the size of a pigeon's egg, which, when cut open, appear to con ain a kind of dusky, reddish substance, like coagulated blood, and hich, in large quantities, has a very strong smell; but, when mixed nd diffused, becomes a very agreeable perfume. Indeed, no substance ow known in the world has a stronger or a more permanent smell. A rain of musk perfumes a whole room; and its odour continues for ome days without diminution. But in a larger quantity it continues or years together; and seems scarce wasted in its weight, although it as filled the atmosphere to a great distance with its parts. It is particu arly used in medicine, in nervous and hysteric disorders; and is found n such cases to be the most powerful remedy now in use; however, the nimal that furnishes this admirable medicine, has been very variously escribed, and is known but very imperfectly.

The description given of this animal by Grew is as follows: "The usk animal is properly neither of the goat nor deer kind, for it has no orns, and it is uncertain whether it ruminates or not; however, it wants he fore-teeth in the upper jaw, in the same manner as in ruminating nimals; but, at the same time, it has tusks like those of a hog. It is hree feet six inches in length, from the head to the tail; and the head s above half a foot long. The fore-part of the head is like that of a reyhound; and the ears are three inches long, and erect, like those f a rabbit; but the tail is not above two inches. It is cloven-footed, ike beasts of the goat kind; the hair on the head and legs is half an nch long, on the belly an inch and a half, and on the back and but ocks three inches, and proportionably thicker than in any other animal. t is brown and white alternately, from the root to the point; on the ead and thighs it is brown, but under the belly and tail white, and a ittle curled, especially on the back and belly. On each side of the ower jaw, under the corners of the mouth, there is a tuft of thick hair, hich is short and hard, and about three quarters of an inch long. The air, in general, of this animal, is remarkable for its softness and fine exture; but what distinguishes it particularly are the tusks, which are n inch and a half long, and turned back in the form of a hook; and ore particularly the bag which contains the musk, which is three nches long, two broad, and stands out from the belly an inch and a half. t is a very fearful animal, and, therefore, it has long ears; and the ense of hearing is so quick, that it can discover an enemy at a great istance."

After so long and circumstantial a description of this animal, its nature s but very little known; nor has any anatomist as yet examined its nternal structure; or been able to inform us whether it be a ruminant animal, or one of the hog kind; how the musk is formed, or whether those bags in which it comes to us be really belonging to the animal, or are only the sophistications of the venders. Indeed, when we consider the immense quantities of this substance which are consumed in Europe alone, not to mention the East, where it is in still greater repute than here, we can hardly suppose that any one animal can furnish the supply; and particularly when it must be killed before the bag can be obtained. We are told, it is true, that the musk is often deposited by the animal upon trees and stones, against which it rubs itself when the quantity becomes uneasy; but it is not in that form which we receive it, but always in what seems to be its own natural bladder. Of these, Taverner brought home near two thousand in one year; and, as the animal is wild, so many must, during that space, have been hunted and taken. But as the creature is represented very shy, and as it is found but in some particular provinces of the East, the wonder is how its bag should be so cheap, and furnished in such great plenty. The bag in common does not cost (if I do not forget) above a crown by retail, and yet this is supposed the only one belonging to the animal; and for the obtaining of which, it must have been hunted and killed. The only way of solving this difficulty, is to suppose that these bags are, in a great measure, counterfeit, taken from some other animal, or from some part of the same, filled with its blood, and a very little of the perfume, but enough to impregnate the rest with a strong and permanent odour. It comes to us from different parts of the East; from China, Tonquin, Bengal, and often from Muscovy: that of Thibet is reckoned the best, and sells for fourteen shillings an ounce; that of Muscovy the worst, and sells but for three; the odour of this, though very strong at first, being quickly found to evaporate. Musk was some years ago in the highest request as a perfume, and but little regarded as a medicine; but at present its reputation is totally changed; and having been found of great benefit in physic, it is but little regarded for the purposes of elegance. It is thus that things which become necessary, cease to continue pleasing; and the consciousness of their use, destroys their power of administering delight.

CHAPTER V.

ANIMALS OF THE DEER KIND.

If we compare the stag and the bull, as to shape and form, no two animals can be more unlike; and yet, if we examine their internal structure, we shall find a striking similitude between them. Indeed, their differences, except to a nice observer, will scarcely be perceivable. All of the deer kind want the gall-bladder; their kidneys are formed differently; their spleen is also proportionably larger; their tail is shorter; and their horns, which are solid, are renewed every year. Such are the slight internal discriminations between two animals, one of which is among the swiftest, and the other the heaviest of the brute creation.

The stag is one of those innocent and peaceable animals that seems made to embellish the forest, and animate the solitudes of Nature. The easy elegance of his form, the lightness of his motions, those large branches that seem made rather for the ornament of his head than its defence, the size, the strength, and the swiftness of this beatiful creature, all sufficiently rank him among the first of quadrupeds, among the most noted objects of human curiosity.

The stag, or hart, whose female is called a *hind*, and the young a *calf*, differs in the size and in horns from a fallow-deer. He is much larger, and his horns are round; whereas in the fallow-kind they are broad and palmated. By these the animal's age is known. The first year the stag has no horns, but a horny excrescence, which is short, rough, and covered with a thin, hairy skin. The next year the horns are single and straight; the third year they have two antlers, three the fourth, four the fifth, and five the sixth; this number is not always certain, for sometimes there are more, and often less. When arrived at the sixth year, the antlers do not always increase; and although the number may amount to six or seven on each side, yet the animal's age is then estimated rather from the size of the antlers, and the thickness of the branch which sustains them, than from their variety. These horns, large as they seem, are, notwithstanding, shed every year, and new ones come in their place. The old horns are of a firm, solid exture, and usually employed in making handles for knives, and other domestic utensils. But while young, nothing can be more soft or tender; and the animal, as if conscious of his own imbecility at those imes, instantly upon shedding his former horns, retires from the rest of his fellows, and hides himself in solitudes and thickets, never venuring out to pasture, except by night. During this time, which most usually happens in the spring, the new horns are very painful, and have a quick sensibility of any external impression. The flies, also, are exremely troublesome to him. When the old horn is fallen off, the new does not begin immediately to appear; but the bones of the skull are seen covered only with a transparent periosteum or skin, which, as anatomists teach us, covers the bones of all animals. After a short ime, however, this skin begins to swell, and to form a soft tumour, which contains a great deal of blood, and which begins to be covered with a downy substance that has the feel of velvet, and appears nearly of the same colour with the rest of the animal's hair. This tumour every day buds forward from the point like the graft of a tree; and, ising by degrees from the head, shoots out the antlers on either side, o that in a few days, in proportion as the animal is in condition, the whole head is completed. However, as was said above, in the beginning, its consistence is very soft, and has a sort of bark, which is no more than a continuation of the integument of the skull. It is velveted and downy, and every where furnished with blood-vessels, that supply he growing horns with nourishment. As they creep along the sides of he branches, the print is marked over the whole surface; and the arger the blood-vessels, the deeper these marks are found to be: from hence arises the inequality of the surface of the deer's horns; which, as we see, are furrowed all along the sides, the impressions diminishing owards the point, where the substance is as smooth and as solid as ivory. But it ought to be observed, that this substance, of which the horns are composed, begins to harden at the bottom while the upper part remains soft, and still continues growing; from whence it appears that the horns grow differently in deer from those of sheep or cows; in which they are always seen to increase from the bottom. However, when the whole head has received its full growth, the extremities then begin to acquire their solidity; the velvet covering, or bark, with its blood-vessels, dry up, and then begin to fall; and this the animal hastens, by rubbing its antlers against every tree it meets. In this manner, the whole external surface being stripped off by degrees, at length the whole head acquires its complete hardness, expansion, and beauty

It would be a vain task to inquire into the cause of the annual production of these horns; it is sufficient to observe, that if a stag be castrated when its horns are fallen off, they will never grow again; and, on the contrary, if the same operation is performed when they are on, they will never fall off. If only one of his testicles are taken out, he will want the horn on that side; if one of the testicles only be tied up, he will want the horn of the opposite side. The increase of their provision also tends to facilitate the growth and the expansion of the horns; and Mr. Buffon thinks it possible to retard their growth entirely by greatly retrenching their food.* As a proof of this, nothing can be more obvious than the difference between a stag bred in fertile pastures and undisturbed by the hunter, and one often pursued and ill-nourished. The former has his head expanded, his antlers numerous, and the branches thick; the latter has but few antlers, the traces of the blood-vessels upon them are but slight, and the expansion but little. The beauty and size of their horns, therefore, mark their strength and their vigour; such of them as are sickly, or have been wounded, never shooting out that magnificent profusion so much admired in this animal. Thus the horns may, in every respect, be resembled to a vegetable substance, grafted upon the head of an animal. Like a vegetable they grow from the extremities; like a vegetable they are for a while covered with a bark that nourishes them; like a vegetable they have their annual production and decay; and a strong imagination might suppose that the leafy productions on which the animal feeds, go once more to vegetate in his horns.†

The stag is usually a twelvemonth old before the horns begin to appear, and then a single branch is all that is seen for the year ensuing. About the beginning of spring, all of this kind are seen to shed their horns, which fall off of themselves; though sometimes the animal assists the efforts of Nature, by rubbing them against a tree. It seldom happens that the branches on both sides fall off at the same time, there often being two or three days between the dropping of the one and the other. The old stags usually shed their horns first; which generally happens towards the latter end of February, or the beginning of March. Those of the second head, (namely, such as are between five and six years old) shed their horns about the middle or latter end of March; those still younger, in the month of April; and the youngest of all, not till the middle, or the latter end of May; they generally shed them in pools of water, whither they retire from the heat; and this has given rise to the opinion of their always hiding their horns. These rules, though true in general, are yet subject to many variations; and universally it is known that a severe winter retards the shedding of the horns. The horns of the stag generally increase in thickness and in height from the second year of its age to the eighth. In this state of perfection they continue during the vigour of life; but as the animal grows old the horns feel the impressions of age, and shrink like the rest of the body. No branch bears more than twenty or twenty-two antlers even in the highest state of vigour; and the number is subject to great variety; for it happens that the stag at one year has either less or more than the year preceding, in proportion to the goodness of his pasture, or the continuance of his security, as these animals seldom thrive when often roused by the hunters. The horns are also found to partake of the nature of the soil; in the more fertile pastures they are large and tender; on the contrary, in the barren soil, they are hard, stunted, and brittle. As soon as the stags have shed their horns, they separate from each other, and seek the plainer parts of the country, remote from every other animal, which they are utterly unable to oppose. They then walk with their heads stooping down, to keep their horns from striking against the branches of the trees above. In this state of imbecility they continue near three months before their heads have acquired their full growth and solidity; and then, by rubbing them against the branches of every thicket, they at length clear them of the skin which had contributed to their growth and nourishment. It is said by some, that the horn takes the colour of the sap of the tree against which it is rubbed; and that some thus become red, when rubbed against the heath; and others brown, by rubbing against the oak; this, however, is a mistake, since stags kept in parks where there are no trees, have a variety in the colour of their horns, which can be ascribed to nothing but Nature. A short time after they have furnished their horns, they begin to feel the impressions of the rut, or the desire of copulation. The old ones are the most forward; and about the end of August, or the beginning of September, they quit their thickets, and return to the mountain in order to seek the hind, to whom they call with a loud, tremulous note. At this time their neck is swoln; they appear bold and furious: fly from country to country; strike with their horns against the trees and other obstacles, and continue restless and fierce until they have found the female; who at first flies from them, but is at last compelled and overtaken. When two stags contend for the same female, how timorous soever they may appear at other times, they then seem agitated with an uncommon degree of ardour. They paw up the earth, menace each other with their horns, bellow with all their force, and striking in a desperate manner against each other, seem determined upon death or victory. This combat continues till one of them is defeated or flies; and it often happens that the victor is obliged to fight several of those battles before it remains undisputed master of the field. The old ones are generally the conquerors upon these occasions, as they have more strength and greater courage; and these also are preferred by the hind to the young ones, as the latter are more feeble, and less ardent. However, they are all equally inconstant, keeping to the female but a few days, and then seeking out for another, not to be enjoyed, perhaps, without a repetition of their former danger.

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* Buffon, vol. xi. p. 113.

† Mr. Buffon has supposed something like this. Vide passim.

In this manner the stag continues to range from one to the other for about three weeks, the time the rut continues; during which he scarce eats, sleeps, or rests, but continues to pursue, to combat, and to enjoy. At the end of this period of madness, for such in this animal it seems to be, the creature that was before so fat, sleek, and glossy, becomes lean, feeble, and timid. He then retires from the herd to seek plenty and repose; he frequents the side of the forest, and chooses the most nourishing pastures, remaining there till his strength is renewed. Thus is his whole life passed in the alternations of plenty and want, of corpulence and inanition, of health and sickness, without having his constitution much affected by the violence of the change. As he is above five years coming to perfection, he lives about forty years; and it is a general rule, that every animal lives about seven or eight times the number of years which it continues to grow. What, therefore, is reported concerning the life of this animal, has arisen from the credulity of ignorance; some say that a stag having been taken in France, with a collar, on which were written these words, "Cæsar hoc me donavit;" this was interpreted of Julius Cæsar; but it is not considered that Cæsar is a general name for kings, and that one of the Emperors of Germany, who are always styled Cæsars, might have ordered the inscription.

This animal may differ in the term of his life according to the goodness of his pasture, or the undisturbed repose he happens to enjoy. These are advantages that influence not only his age, but his size and his vigour. The stags of the plains, the valleys, and the little hills, which abound in corn and pasture, are much more corpulent and much taller than such as are bred on the rocky waste, or the heathy mountain. The latter are low, small, and meagre, incapable of going so swift as the former, although they are found to hold out much longer. They are also more artful in evading the hunters; their horns are generally black and short, while those of the lowland stags are reddish and flourishing; so that the animal seems to increase in beauty and stature in proportion to the goodness of the pasture, which he enjoys in security.

The usual colour of the stag in England was red; nevertheless, the greater number in other countries are brown. There are some few that are white; but these seem to have obtained this colour in a former state of domestic tameness. Of all the animals that are natives of this climate, there are none that have such a beautiful eye as the stag; it is sparkling, soft, and sensible. His senses of smelling and hearing are in no less perfection. When he is in the least alarm, he lifts the head and erects the ears, standing for a few minutes as if in a listening posture. Whenever he ventures upon some unknown ground, or quits his native covering, he first stops at the skirt of the plain to examine all around; he next turns against the wind to examine by the smell if there be any enemy approaching. If a person should happen to whistle or call out, at a distance, the stag is seen to stop short in his slow measured pace, and gazes upon the stranger with a kind of awkward admiration: if the cunning animal perceives neither dogs nor fire-arms preparing against him, he goes forward, quite unconcerned, and slowly proceeds without offering to fly. Man is not the enemy he is most afraid of; on the contrary, he seems to be delighted with the sound of the shepherd's pipe;

and the hunters sometimes make use of that instrument to allure the poor animal to his destruction.

The stag eats slowly, and is very delicate in the choice of his pasture. When he has eaten a sufficiency, he then retires to the covert of some thicket to chew the cud in security. His rumination, however, seems performed with much greater difficulty than with the cow or sheep; for the grass is not returned from the first stomach without much straining, and a kind of hiccup, which is easily perceived during the whole time it continues. This may proceed from the greater length of his neck and the narrowness of the passage, all those of the cow and the sheep kind having it much wider.

This animal's voice is much stronger, louder, and more tremulous in proportion as he advances in age; in the time of rut it is even terrible. At that season he seems so transported with passion, that nothing obstructs his fury; and, when at bay, he keeps the dogs off with great intrepidity. Some years ago, William Duke of Cumberland caused a tiger and a stag to be inclosed in the same area; and the stag made so bold a defence, that the tiger was at last obliged to fly. The stag seldom drinks in the winter, and still less in the spring, while the plants are tender and covered over with dew. It is in the heat of summer, and during the time of rut, that he is seen constantly frequenting the sides of rivers and lakes, as well to slake his thirst as to cool his ardour. He swims with great ease and strength, and best at those times when he is fattest, his fat keeping him buoyant, like oil upon the surface of the water. During the time of rut he even ventures out to sea, and swims from one island to another, although there may be some leagues distance between them.

The cry of the hind, or female, is not so loud as that of the male, and is never excited but by apprehension for herself or her young. It need scarce be mentioned that she has no horns, or that she is more feeble and unfit for hunting than the male. When once they have conceived, they separate from the males, and then they both herd apart. The time of gestation continues between eight and nine months, and they generally produce but one at a time. Their usual season for bringing forth is about the month of May, or the beginning of June, during which they take great care to hide their young in the most obscure thickets. Nor is this precaution without reason, since almost every creature is then a formidable enemy. The eagle, the falcon, the osprey, the wolf, the dog, and all the rapacious family of the cat kind, are in continual employment to find out her retreat. But what is more unnatural still, the stag himself is a professed enemy, and she is obliged to use all her arts to conceal her young from him, as from the most dangerous of her pursuers. At this season, therefore, the courage of the male seems transferred to the female; she defends her young against her less formidable opponents by force; and when pursued by the hunter, she ever offers herself to mislead him from the principal objects of her concern. She flies before the hounds for half the day, and then returns to her young, whose life she has thus preserved at the hazard of her own. The *calf*, for so the young of this animal is called, never quits the dam during the whole summer; and in winter, the hind, and all the males under a year old, keep together, and assemble in herds, which are more numerous in proportion as the season is more severe. In the spring they separate; the hinds to bring forth, while none but the year olds remain together; these animals are, however, in general, fond of herding and grazing in company; it is danger or necessity alone that separates them.

The dangers they have to fear from other animals, are nothing when compared to those from man. The men of every age and nation have made the chase of the stag one of their most favourite pursuits; and those who first hunted from necessity, have continued it for amusement. In our own country, in particular, hunting was ever esteemed as one of the principal diversions of the great.* At first, indeed, the beasts of chase had the whole island for their range, and knew no other limits than those of the ocean.

The Roman jurisprudence, which was formed on the manners of the first ages, established it as a law, that, as the natural right of things which have no master, belongs to the first possessor, wild beasts, birds, and fishes, are the property of whosoever could first take them. But the northern barbarians, who overran the Roman empire, bringing with them the strongest relish for this amusement, and, being now possessed of more easy means of subsistence from the lands they had conquered, their chiefs and leaders began to appropriate the right of hunting, and, instead of a natural right, to make it a royal one. When the Saxon kings, therefore, had established themselves in a heptarchy, the chases were reserved by each sovereign for his own particular amusement. Hunting and war, in those uncivilized ages, were the only employment of the great. Their active, but uncultivated minds, were susceptible of no pleasures but those of a violent kind, such as gave exercise to their bodies, and prevented the uneasiness of thinking. But as the Saxon kings only appropriated those lands to the business of the chase which were unoccupied before, so no individuals received any injury. But it was otherwise when the Norman kings were settled upon the throne. The passion for hunting was then carried to an excess, and every civil right was involved in general ruin. This ardour for hunting was stronger than the consideration of religion even in a superstitious age. The village communities, nay, even the most sacred edifices, were thrown down, and all turned into one vast waste to make room for animals, the objects of a lawless tyrant's pleasure. Sanguinary laws were enacted to preserve the game; and, in the reigns of William Rufus and Henry I. it was less criminal to destroy one of the human species than a beast of chase. Thus it continued while the Norman line filled the throne; but when the Saxon line was restored, under Henry II. the rigour of the forest-laws were softened. The barons also for a long time imitated the encroachments, as well as the amusements, of the monarchs; but when property became more equally divided, by the introduction of arts and industry, these extensive hunting grounds became more limited; and as tillage and husbandry increased, the beasts of chase were obliged to give way to others more useful to the community. Those vast tracts of land, before dedicated to hunting were then contracted; and, in proportion as the useful arts gained ground, they protected and encouraged the labours of the industrious, and repressed the licentiousness of the sportsman. It is, therefore, among the subjects of despotic government only, that these laws remain in full force; where large wastes lie uncultivated for the purpose of hunting; where the husbandman can find no protection from the invasions of his lord, or the continual depredations of those animals which he makes the objects of his pleasure.

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* British Zoology.

In the present cultivated state of this country, therefore, the stag is unknown in its wild natural state; and such of them as remain among us are kept, under the name of *red deer*, in parks among the fallow-deer. But they are become less common than formerly; its excessive viciousness, during the rutting season, and the badness of its flesh, inducing most people to part with the species. The few that still remain wild, are to be found on the moors that border on Cornwall and Devonshire; and in Ireland, on most of the large mountains of that country.

In England, the hunting the stag and the buck are performed in the same manner; the animal is driven from some gentleman's park, and then hunted through the open country. But those who pursue the wild animal, have a much higher object, as well as a greater variety in the chase. To let loose a creature that was already in our possession, in order to catch it again, is, in my opinion, but a poor pursuit, as the reward, when obtained, is only what we before had given away. But to pursue an animal that owns no proprietor, and which he that first seizes may be said to possess, has something in it that seems at least more rational; this rewards the hunter for his toil, and seems to repay his industry. Besides, the superior strength and swiftness of the wild animal prolongs the amusement; it is possessed of more various arts to escape the hunter, and leads him to precipices where the danger ennobles the chase. In pursuing the animal let loose from a park, as it is unused to danger, it is but little versed in the stratagems of escape; the hunter follows as sure of overcoming, and feels none of those alternations of hope and fear which arise from the uncertainty of success. But it is otherwise with the mountain stag: having spent his whole life in a state of continual apprehension; having frequently been followed, and as frequently escaped, he knows every trick to mislead, to confound, or intimidate his pursuers; to stimulate their ardour, and enhance their success.

Those who hunt this animal have their peculiar terms for the different objects of their pursuit. The professors in every art take a pleasure in thus employing a language known only to themselves, and thus accumulate words which, to the ignorant, have the appearance of knowledge. In this manner, the stag is called the first year, a *calf*, or *hind calf*; the second year a *knobber*; the third, a *brock*; the fourth, a *stag-guard*; the fifth, a *stag*; the sixth, a *hart*. The female is called a *hind*; the first year she is a *calf*; the second, a *hearse*; the third, a *hind*. This animal is said to *harbour* in the place where he resides. When he cries, he is said to *bell*; the print of his hoof is called the *slot*; his tail is called the *single*; his excrement the *fewmet*; his horns are called his *head*: when simple, the first year, they are called *broches*; the third year, *spears*; the fourth year, that part which bears the antlers is called the *beam*, and the little impressions upon its surface, *glitters;* those which rise from the crust of the beam are called *pearls* The antlers also have distinct names; the first that branches off is called the *antler;* the second, the *sur-antler;* all the rest which grow afterwards, till you come to the top, which is called the *crown,* are called *royal antlers;* the little buds about the tops are called *croches.* The impression on the place where the stag has lain, is called the *layer.* If it be in covert or a thicket, it is called his *harbour.* When a deer has passed into a thicket, leaving marks whereby his bulk may be guessed, it is called an *entry.* When they cast their heads, they are said to *mew.* When they rub their heads against trees, to bring off the peel of their horns, they are said to *fray.* When a stag hard-hunted takes to swimming in the water, he is said to *go sail;* when he turns his head against the hounds, he is said to *bay;* and when the hounds pursue upon the scent, until they have unharboured the stag, they are said to *draw on the slot.*

Such are but a few of the many terms used by hunters in pursuing of the stag, most of which are now laid aside, or in use only among the game-keepers. The chase, however, is continued in many parts of the country where the red deer is preserved, and still makes the amusement of such as have not found out more liberal entertainments. In those few places where the animal is perfectly wild, the amusement, as was said above, is superior. The first great care of the hunter, when he leads out his hounds to the mountain side, where the deer are generally known to harbour, is to make choice of a proper stag to pursue. His ambition is to unharbour the largest and the boldest of the whole herd; and for this purpose he examines the track, if there be any, which if he finds long and large, he concludes, that it must have belonged to a stag, and not a hind, the print of whose foot is rounder. Those marks also which he leaves on trees by the rubbing of his horns, show his size, and point him out as the proper object of pursuit. Now to seek out a stag in his haunt, it is to be observed, that he changes his manner of feeding every month. From the conclusion of rutting-time, which is November, he feeds in heaths and broomy places. In December they herd together, and withdraw into the strength of the forests, to shelter themselves from the severe weather, feeding on holm, elder-trees, and brambles. The three following months they leave herding, but keep four or five in a company, and venture out to the corners of the forest, where they feed on winter pasture, sometimes making their incursions into the neighbouring corn-fields, to feed upon the tender shoots, just as they peep above ground. In April and May they rest in thickets and shady places, and seldom venture forth unless rouzed by approaching danger. In September and October their annual ardour returns; and then they leave the thickets, boldly facing every danger, without any certain place for food or harbour. When, by a knowledge of these circumstances, the hunter has found out the residence, and the quality of his game, his next care is to uncouple and cast off his hounds in the pursuit: these no sooner perceive the timorous animal that flies before them, but they altogether open in full cry, pursuing rather by the scent than the view, encouraging each other to continue the chase, and tracing the flying animal with the most amazing sagacity. The hunters also are not less ardent in their speed on horseback, cheering up the dogs, and directing them where to pursue. On the other hand, the stag, when unharboured, flies at first with the swiftness of the wind, leaving his pursuers several miles in the rear; and at length having gained his former coverts, and no longer hearing the cries of the dogs and men that he had just left behind, he stops, gazes round him, and seems to recover his natural tranquillity. But this calm is of short duration, for his inveterate pursuers slowly and securely trace him along, and he once more hears the approaching destruction from behind. He again, therefore, renews his efforts to escape, and again leaves his pursuers at almost the former distance; but this second effort makes him more feeble than before, and when they come up a second time, he is unable to outstrip them with equal velocity. The poor animal now, therefore, is obliged to have recourse to all his little arts of escape, which, sometimes, though but seldom, avail him. In proportion as his strength fails him, the ardour of his pursuers is inflamed; he tracks more heavily on the ground, and this increasing the strength of the scent, redoubles the cries of the hounds, and enforces their speed. It is then that the stag seeks for refuge among the herd, and tries every artifice to put off some other head for his own. Sometimes he will send forth some little deer in his stead, in the mean time lying close himself, that the hounds may overshoot him. He will break into one thicket after another, to find deer, rouzing them, gathering them together, and endeavouring to put them upon the tracks he has made. His old companions, however, with a true spirit of ingratitude, now all forsake and shun him with the most watchful industry, leaving the unhappy creature to take his fate by himself. Thus abandoned of his fellows, he again tries other arts, by doubling and crossing in some hard beaten highway, where the scent is least perceivable. He now also runs against the wind, not only to cool himself, but the better to hear the voice, and judge of the distance of his implacable pursuers. It is now easily perceivable how sorely he is pressed, by his manner of running, which, from the bounding, easy pace with which he began, is converted into a stiff and short manner of going; his mouth also is black and dry, without foam on it; his tongue hangs out; and the tears, as some say, are seen starting from his eyes. His last refuge, when every other method of safety has failed him, is to take the water, and to attempt an escape by crossing whatever lake or river he happens to approach. While swimming, he takes all possible care to keep in the middle of the stream, lest, by touching the bough of a tree, or the herbage on the banks, he may give scent to the hounds. He is also ever found to swim against the stream; whence the huntsmen have made into a kind of proverb, *That he that would his chase find, must up with the river and down with the wind.* On this occasion too he will often cover himself under water, so as to show nothing but the tip of his nose. Every resource, and every art being at length exhausted, the poor creature tries the last remains of his strength, by boldly opposing those enemies he cannot escape; he therefore faces the dogs and men, threatens with his horns, guards himself on every side, and for sometime stands at bay. In this manner, quite desperate, he furiously aims at the first dog or man that approaches; and it often happens that he does not die unrevenged. At that time, the more prudent, both of the dogs and men, seem willing to avoid him, but the whole pack quickly coming up, he is soon surrounded and brought down, and the huntsman winds a *treble mort*, as it is called, with his horn.

Such is the manner of pursuing this animal in England; but every country has a peculiar method of its own, adapted either to the nature of the climate, or the face of the soil. The ancient manner was very different from that practised at present; they used their dogs only to find out the game, but not to rouze it. Hence they were not curious as to the music of their hounds, or the composition of their pack; the dog that opened before he had discovered his game, was held in no estimation. It was their usual manner silently to find out the animal's retreat, and surround it with nets and engines, then to drive him up with all their cries, and thus force him into the toils which they have previously prepared. In succeeding times the fashion seemed to alter; and particularly in Sicily, the manner of hunting was as follows.* The nobles and gentry being informed which way a herd of deer passed, gave notice to one another, and appointed a day of hunting. For this purpose, every one was to bring a cross-bow, or a long bow, and a bundle of staves, shod with iron, the heads bored, with a cord passing through them all. Thus provided, they came to where the herd continued grazing, and casting themselves about in a large ring, surrounded the deer on every side. Then each taking his stand, unbound his fagot, set up his stake, and tied the end of the cord to that of his next neighbour, at the distance of about ten feet one from the other. Between each of these stakes was hung a bunch of crimson feathers, and so disposed, that with the least breath of wind they would whirl round, and preserve a sort of fluttering motion. This done, the persons who set up the staves withdrew, and hid themselves in the neighbouring coverts; then the chief huntsman, entering with his hounds within the lines, rouzed the game with a full cry. The deer, frighted, and flying on all sides, upon approaching the lines, were scared away by the fluttering of the feathers, and wandered about within this artificial paling, still awed by the shining and fluttering plumage that encircled their retreat; the huntsman, however, still pursuing, and calling every person by name, as he passed by their stand, commanded him to shoot the first, third, or sixth, as he pleased; and if any of them missed, or singled out another than that assigned him, it was considered as a most shameful mischance. In this manner, however, the whole herd was at last destroyed; and the day concluded with mirth and feasting.

The stags of China are of a particular kind, for they are no taller than a common house-dog; and hunting them is one of the principal diversions of the great. Their flesh, while young, is exceedingly good; but when they arrive at maturity, it begins to grow hard and tough: however, the tongue, the muzzle, and the ears, are in particular esteem among that luxurious people. Their manner of taking them is singular enough: they carry with them the heads of some of the females stuffed, and learn exactly to imitate their cry; upon this the male does not fail to appear, and looking on all sides, perceives the head, which is all that the hunter, who is himself concealed, discovers. Upon their nearer approach, the whole company rise, surround, and often take him alive.

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* Pier Hieroglyph. lib vii. chap. vi.

There are very few varieties in the red deer of this country; and they are mostly found of the same size and colour. But it is otherwise in different parts of the world, where they are seen to differ in form, in size, in horns, and in colour.

The stag of Corsica is a very small animal, being not above half the size of those common among us. His body is short and thick, his legs short, and his hair of a dark brown.

There is in the forests of Germany, a kind of stag, named by the ancients the *Tragelaphus*, and which the natives call the *bran deer*, or the *brown deer*. This is of a darker colour than the common stag, of a lighter shade upon the belly, long hair upon the neck and throat, by which it appears bearded, like the goat.

There is also a very beautiful stag, which by some is said to be a native of Sardinia; but others (among whom is Mr. Buffon) are of opinion that it comes from Africa or the East-Indies. He calls it the *axis*, after Pliny; and considers it as making the shade between the stag and the fallow-deer. The horns of the axis are round, like those of the stag; but the form of its body entirely resembles that of the buck, and the size also is exactly the same. The hair is of four colours; namely, fallow, white, black, and gray. The white is predominant under the belly, on the inside of the thighs and the legs. Along the back there are two rows of spots in a right line; but those on other parts of the body are very irregular. A white line runs along each side of this animal, while the head and neck are gray. The tail is black above, and white beneath; and the hair upon it is six inches long.

Although there are but few individuals of the deer kind, yet the race seems diffused over all parts of the earth. The new continent of America, in which neither the sheep, the goat, nor the gazelle, have been originally bred, nevertheless produces stags, and other animals of the deer kind, in sufficient plenty. The Mexicans have a breed of white stags in their parks, which they call *stags royal.** The stags of Canada differ from ours in nothing except the size of the horns, which in them is greater; and the direction of the antlers, which rather turn back, than project forward, as in those of Europe. The same difference of size that obtains among our stags, is also to be seen in that country; and, as we are informed by Ruysch, the Americans have brought them into the same state of domestic tameness that we have our sheep, goats, or black cattle. They send them forth in the day-time to feed in the forests; and at night they return home with the herdsman who guards them. The inhabitants have no other milk but what the hind produces; and use no other cheese but what is made from thence. In this manner we find, that an animal which seems made only for man's amusement, may be easily brought to supply his necessities. Nature has many stores of happiness and plenty in reserve, which only want the call of industry to be produced, and now remain as candidates for human approbation.

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* Buffon, vol. xii. p. 35.

THE FALLOW-DEER.

No two animals can be more nearly allied than the stag and the fallow-deer.* Alike in form, alike in disposition, in the superb furniture of their heads, in their swiftness and timidity; and yet no two animals keep more distinct, or avoid each other with more fixed animosity. They are never seen to herd in the same place, they never engender together, or form a mixed breed; and even in those countries where the stag is common, the buck seems to be entirely a stranger; in short, they both form distinct families; which, though so seemingly near, are still remote: and although with the same habitudes, yet retain an unalterable aversion. The fallow-deer, as they are much smaller, so they seem of a nature less robust, and less savage than those of the stag kind. They are found but rarely wild in the forests; they are, in general, bred up in parks, and kept for the purposes of hunting, or of luxury, their flesh being preferred to that of any other animal. It need scarce be mentioned, that the horns of the buck make its principal distinction, being broad and palmated; whereas those of the stag are in every part round. In the one, they are flatted and spread like the palm of the hand; in the other they grow like a tree, every branch being of the shape of the stem that bears it. The fallow-deer also has the tail longer, and the hair lighter than the stag; in other respects, they pretty near resemble one another.

The head of the buck, as of all other animals of this kind, is shed every year, and takes the usual time for repairing. The only difference between it and the stag is, that this change happens later in the buck; and its rutting-time, consequently, falls more into the winter. It is not found so furious at this season as the former; nor does it so much exhaust itself by the violence of its ardour. It does not quit its natural pastures in quest of the female, nor does it attack other animals with indiscriminate ferocity: however, the males combat for the female among each other; and it is not without many contests, that one buck is seen to become master of the whole herd. It often happens also, that a herd of fallow-deer is seen to divide into two parties, and engage each other with great ardour and obstinacy.† They both seem desirous of gaining some favourite spot of the park for pasture, and of driving the vanquished party into the coarser and more disagreeable parts. Each of these factions has its particular chief; namely, the two oldest and strongest of the herd. These lead on to the engagement; and the rest follow under their direction. These combats are singular enough, from the disposition and conduct which seems to regulate their mutual efforts. They attack with order, and support the assault with courage; they come to each other's assistance, they retire, they rally, and never give up the victory upon a single defeat. The combat is renewed for several days together; until at length the most feeble side is obliged to give way, and is content to escape to the most disagreeable part of the park, where only they can find safety and protection.

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* Buffon, vol. xii. p. 36

† Ibid. vol. xii. p. 36.

The fallow-deer is easily tamed, and feeds upon many things which the stag refuses. By this means it preserves its venison better; and even after rutting, it does not appear entirely exhausted. It continues almost in the same state through the whole year, although there are particular seasons when its flesh is chiefly in esteem. This animal also browzes closer than the stag; for which reason it is more prejudicial among young trees, which it often strips too close for recovery. The young deer eat much faster and more greedily than the old; they seek the female at their second year; and, like the stag, are fond of variety. The doe goes with young above eight months, like the hind; and commonly brings forth one at a time: but they differ in this, that the buck comes to perfection at three, and lives till sixteen; whereas the stag does not come to perfection till seven, and lives till forty.

As this animal is a beast of chase, like the stag, so the hunters have invented a number of names relative to him. The buck is the first year called a *fawn;* the second, a *pricket;* the third, a *sorel;* the fourth, a *sore;* the fifth, a *buck of the first head;* and the sixth, a *great buck:* The female is called a *doe;* the first year a *fawn;* and the second, a *tegg.* The manner of hunting the buck is pretty much the same as that of stag-hunting, except that less skill is required in the latter. The buck is more easily rouzed: it is sufficient to judge by the view, and mark what grove or covert it enters, as it is not known to wander far from thence; nor, like the stag, to change its *layer*, or place of repose. When hard hunted, it takes to some strong hold, or covert, with which it is acquainted, in the more gloomy parts of the wood, or the steeps of the mountain; not like the stag, flying before the hounds, nor crossing nor doubling, nor using any of the subtleties which the stag is accustomed to. It will take the water when sorely pressed, but seldom a great river; nor can it swim so long, nor so swiftly, as the former. In general, the strength, the cunning, and the courage of this animal, are inferior to those of the stag; and, consequently, it affords neither so long, so various, nor so obstinate a chase: besides, being lighter, and not tracing so deeply, it leaves a less powerful and lasting scent, and the dogs in the pursuit are more frequently at a fault.

As the buck is a more delicate animal than the stag, so also it is subject to greater varieties.* We have in England two varieties of the fallow-deer, which are said to be of foreign origin. The beautiful spotted kind, which is supposed to have been brought from Bengal; and the very deep brown sort, that are now so common in several parts of this kingdom. These were introduced by king James the First from Norway: for having observed their hardiness, and that they could endure the winter, even in that severe climate, without fodder, he brought over some of them into Scotland, and disposed of them among his chases. Since that time they have multiplied in many parts of the British empire; and England is now become more famous for its venison, than any other country in the world. Whatever pains the French have taken to rival us in this particular, the flesh of their fallow-deer, of which they keep but a few, has neither the fatness nor the flavour of that fed upon English pasture.

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* British Zoology.

However, there is scarce a country in Europe, except far to the northward, in which this animal is a stranger. The Spanish fallow deer are as large as stags, but of a darker colour, and a more slender neck: their tails are longer than those of ours, they are black above, and white below. The Virginian deer are larger and stronger than ours, with great necks, and their colour inclinable to gray. Other kinds have the hoofs of their hind legs marked outwardly with a white spot; and their ears and tail much longer than the common. One of these has been seen full of white spots, with a black list down the middle of his back. In Guiana, a country of South America, according to Labat, there are deer without horns, which are much less than those of Europe, but resembling them in every other particular. They are very lively, light of course, and excessively fearful; their hair is of a reddish fallow, their heads are small and lean, their ears little, their necks long and arched, the tail short, and the sight piercing. When pursued, they fly into places where no other animal can follow them. The negroes, who pursue them, stand to watch for them in narrow paths, which lead to the brook, or the meadow where they feed; there waiting in the utmost silence, for the slightest sound will drive them away, the Negro, when he perceives the animal within reach, shoots, and is happy if he can bring down his game. Their flesh, though seldom fat, is considered as a great delicacy, and the hunter is well rewarded for his trouble.

THE ROE-BUCK.

The roe-buck is the smallest of the deer kind known in our climate, and is now almost extinct among us, except in some parts of the Highlands of Scotland. It is generally about three feet long, and about two feet high. The horns are from eight to nine inches long, upright, round, and divided into only three branches. The body is covered with very long hair, well adapted to the rigour of its mountainous abode. The lower part of each hair is ash colour; near the ends is a narrow bar of black, and the points are yellow. The hairs on the face are black, tipped with ash colour. The ears are long, their insides of a pale yellow, and covered with long hair. The spaces bordering on the eyes and mouth, are black. The chest, belly, and legs, and the inside of the thighs, are of a yellowish white; the rump is of a pure white, and the tail very short. The make of this little animal is very elegant; and its swiftness equals its beauty. It differs from the fallow-deer, in having round horns, and not flatted like theirs. It differs from the stag, in its smaller size, and the proportionable paucity of its antlers: and it differs from all of the goat kind, as it annually sheds its head, and obtains a new one, which none of that kind are ever seen to do.

As the stag frequents the thickest forests, and the sides of the highest mountains, the roe-buck, with humbler ambition, courts the shady thicket, and the rising slope. Although less in size, and far inferior in strength to the stag, it is yet more beautiful, more active, and even more courageous Its hair is always smooth, clean, and glossy; and it frequents only the dryest places, and of the purest air. Though but a very little animal, as we have already observed, yet when its young is attacked it faces even the stag himself, and often comes off victo nous.* All its motions are elegant and easy; it bounds without effort, and continues the course with but little fatigue. It is also possessed of more cunning in avoiding the hunter, is more difficult to pursue, and, although its scent is much stronger than that of the stag, it is more frequently found to make a good retreat. It is not with the roe-buck, as with the stag, who never offers to use art until his strength is beginning to decline; this more cunning animal, when it finds that its first efforts to escape are without success, returns upon its former track, again goes forward, and again returns, until by its various windings it has entirely confounded the scent, and joined the last emanations to those of its former course. It then, by a bound, goes to one side, lies flat upon its belly, and permits the pack to pass by very near, without offering to stir.

But the roe-buck differs not only from the stag in superior cunning, but also in its natural appetites, its inclinations, and its whole habits of living. Instead of herding together, these animals live in separate families; the sire, the dam, and the young ones, associate together, and never admit a stranger into their little community. All others of the deer kind are inconstant in their affection; but the roe-buck never leaves its mate; and, as they have been generally bred up together from their first fawning, they conceive so strong an attachment, the male for the female, that they never after separate. Their rutting-season continues but fifteen days; from the latter end of October to about the middle of November. They are not at that time, like the stag, overloaded with fat; they have not that strong odour, which is perceived in all others of the deer kind; they have none of those furious excesses; nothing, in short, that alters their state; they only drive away their fawns upon these occasions; the buck forcing them to retire, in order to make room for a succeeding progeny; however, when the copulating season is over, the fawns return to their does, and remain with them some time longer; after which, they quit them entirely, in order to begin an independent family of their own. The female goes with young but five months and a half, which alone serves to distinguish this animal from all others of the deer kind, that continue pregnant more than eight. In this respect, she rather approaches more nearly to the goat kind; from which, however, this race is separated by the male's annually casting its horns.

When the female is ready to bring forth, she seeks a retreat in the thickest part of the woods, being not less apprehensive of the buck, from whom she then separates than of the wolf, the wild-cat, and almost every raveuous animal of the forest; she generally produces two at a time, and three but very rarely. In about ten or twelve days these are able to follow the dam, except in cases of warm pursuit, when their strength is not equal to the fatigue. Upon such occasions, the tenderness of the dam is very extraordinary; leaving them in the deepest thickets, she offers herself to the danger, flies before the hounds, and does all in her power to lead them from the retreat where she has lodged her little ones. Such animals as are nearly upon her own level she boldly encounters; attacks the stag, the wild-cat, and even the wolf; and while she has life, continues her efforts to protect her young. Yet all her endeavours are often vain; about the month of May, which is her fawning time, there is a greater destruction among those animals than at any other season of the year. Numbers of the fawns are taken alive by the peasants; numbers are found out, and worried by the dogs; and still more by the wolf, which has always been their most inveterate enemy. By these continual depredations upon this beautiful creature, the roe-buck is every day becoming scarcer; and the whole race in many countries is wholly worn out. They were once common in England; the huntsmen, who characterized only such beasts as they knew, have given names to the different kinds and ages as to the stag: thus they called it the first year a *hind;* the second, a *gyrle;* and the third, a *hemuse;* but these names at present are utterly useless, since the animal no longer exists among us. Even in France, where it was once extremely common, it is now confined to a few provinces; and it is probable that in an age or two the whole breed will be utterly extirpated. Mr. Buffon, indeed, observes, that in those districts where it is mostly found, it seems to maintain its usual plenty, and that the balance between its destruction and increase is held pretty even; however, the number in general is known to decrease; for wherever cultivation takes place the beasts of Nature are known to retire. Many animals that once flourished in the world may now be extinct; and the descriptions of Aristotle and Pliny, though taken from life, may be considered as fabulous, as their archetypes are no longer existing.

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* Buffon, vol. xii. p. 75.

The fawns continue to follow the deer eight or nine months in all; and, upon separating, their horns begin to appear simple, and without antlers, the first year, as in those of the stag kind.* These they shed at the latter end of autumn, and renew during the winter; differing in this from the stag, who sheds them in spring, and renews them in summer. When the roe-buck's head is completely furnished, it rubs the horns against the trees in the manner of the stag, and thus strips them of the rough skin and the blood-vessels, which no longer contribute to their nourishment and growth. When these fall, and new ones begin to appear, the roe-buck does not retire as the stag to the covert of the wood, but continues its usual haunts, only keeping down its head to avoid striking its horns against the branches of trees, the pain of which it seems to feel with exquisite sensibility. The stag, who sheds his horns in summer, is obliged to seek a retreat from the flies, that at that time greatly incommode him; but the roe-buck, who sheds them in winter, is under no such necessity; and, consequently, does not separate from its little family, but keeps with the female all the year round.†

As the growth of the roe-buck, and its arrival at maturity, is much speedier than that of the stag, so its life is proportionably shorter. It seldom is found to extend above twelve or fifteen years; and, if kept tame, it does not live above six or seven. It is an animal of a very delicate constitution, requiring variety of food, air, and exercise. It must be paired with a female, and kept in a park of at least a hundred acres. They may easily be subdued, but never thoroughly tamed. No arts can teach them to be familiar with the feeder, much less attached to him. They still preserve a part of their natural wildness, and are subject to terrors without a cause. They sometimes, in attempting to

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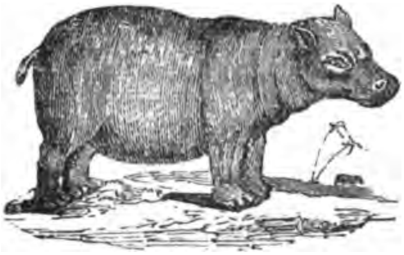
* Buffon, vol xii. n. 88 † Buffon, ibid.



Hippopotamus, p. 222.

Rein Deer, p. 81

Elk, p. 77.

To face p. 77, vol. ii.

escape, strike themselves with such force against the walls of their inclosure, that they break their limbs, and become utterly disabled. Whatever care is taken to tame them, they are never entirely to be relied on, as they have capricious fits of fierceness, and sometimes strike at those they dislike with a degree of force that is very dangerous.

The cry of the roe-buck is neither so loud nor so frequent as that of the stag. The young ones have a particular manner of calling to the dam, which the hunters easily imitate, and often thus allure the female to her destruction. Upon some occasions also they become in a manner intoxicated with their food, which, during the spring, is said to ferment in their stomachs, and they are then very easily taken. In summer they keep close under covert of the forest, and seldom venture out, except in violent heats, to drink at some river or fountain. In general, however, they are contented to slake their thirst with the dew that falls on the grass and the leaves of trees, and seldom risk their safety to satisfy their appetite. They delight chiefly in hilly grounds, preferring the tender branches and buds of trees to corn, or other vegetables; and it is universally allowed that the flesh of those between one and two years old is the greatest delicacy that is known. Perhaps, also, the scarceness of it enhances its flavour.

In America this animal is much more common than in Europe. With us there are but two known varieties; the red, which is the largest sort; and the brown, with a spot behind, which is less. But in the new continent the breed is extremely numerous, and the varieties in equal proportion. In Louisiana, where they are extremely common, they are much larger than in Europe, and the inhabitants live in a great measure upon its flesh, which tastes like mutton when well fatted. They are found also in Brazil, where they have the name of *cugacu apara*, only differing from ours in some slight deviations in the horns. This animal is also said to be common in China; although such as have described it seem to confound it with the musk goat, which is of a quite different nature.

THE ELK.

We have hitherto been describing minute animals in comparison of the elk; the size of which, from concurrent testimony, appears to be equal to that of the elephant itself. It is an animal rather of the buck than the stag kind, as its horns are flatted towards the top; but it is far beyond both in stature, some of them being known to be above ten feet high. It is a native both of the old and new continent, being known in Europe under the name of the *elk*, and in America by that of the *moose-deer*. It is sometimes taken in the German and Russian forests, although seldom appearing; but it is extremely common in North America, where the natives pursue, and track it in the snow. The accounts of this animal are extremely various; some describing it as being no higher than a horse, and others above twelve feet high.

As the stature of this creature makes its chief peculiarity, so it were to be wished that we could come to some precision upon that head. If we were to judge of its size by the horns, which are sometimes fortuitously dug up in many parts of Ireland, we should not be much amiss in ascribing them to an animal at least ten feet high. One of these I have seen, which was ten feet nine inches from one tip to the other. From such dimensions it is easy to perceive that it required an animal far beyond the size of a horse to support them. To bear a head with such extensive and heavy antlers, required no small degree of strength; and without all doubt the bulk of the body must have been proportionable to the size of the horns. I remember some years ago, to have seen a small moose-deer, which was brought from America, by a gentleman of Ireland: it was about the size of a horse, and the horns were very little larger than those of a common stag: this, therefore, serves to prove that the horns bear an exact proportion to the animal's size; the small elk has but small horns; whereas those enormous ones, which we have described above, must have belonged to a proportionable creature. In all the more noble animals, Nature observes a perfect symmetry; and it is not to be supposed she fails in this single instance. We have no reason, therefore, to doubt the accounts of Jocelyn and Dudley, who affirm that they have been found fourteen spans; which at nine inches to a span, makes the animal almost eleven feet high. Others have extended their accounts to twelve and fourteen feet, which makes this creature one of the most formidable of the forest.

There is but very little difference between the European elk and the American moose-deer, as they are but varieties of the same animal. It may be rather larger in America than with us; as in the forests of that unpeopled country, it receives less disturbance than in our own. In all places, however, it is timorous and gentle; content with its pasture, and never willing to disturb any other animal, when supplied itself. The European elk grows to above seven or eight feet high. In the year 1742, there was a female of this animal shown at Paris, which was caught in a forest of Red Russia, belonging to the Cham of Tartary;* it was then but young, and its height was even at that time six feet seven inches; but the describer observes, that it has since become much taller and thicker, so that we may suppose this female at least seven feet high. There have been no late opportunities of seeing the male; but, by the rule of proportion, we may estimate his size at eight or nine feet at the least, which is about twice as high as an ordinary horse. The height, however, of the female, which was measured, was but six feet seven inches, Paris measure; or almost seven English feet high. It was ten feet from the tip of the nose to the insertion of the tail; and eight feet round the body. The hair was very long and coarse, like that of a wild boar. The ears resembled those of a mule, and were a foot and a half long. The upper jaw was longer by six inches than the lower; and, like other ruminating animals, it had no teeth (cutting-teeth, I suppose the describer means.) It had a large beard under the throat, like a goat; and in the middle of the forehead, between the horns, there was a bone as large as an egg. The nostrils were four inches long on each side of the mouth. It made use of its fore-feet, as a defence against its enemies. Those who showed it, asserted that it ran with astonishing swiftness; and that it swam also with equal expedition, and was very fond of the water. They gave it thirty pounds of bread every day, besides hay, and it drank eight buckets of water. It was tame and familiar, and submissive enough to its keeper.

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* Dictionnaire Raisonée des Animaux, Au Nom, Elan.

This description differs in many circumstances from that which we have of the moose, or American elk, which the French call the original. Of these there are two kinds, the common light gray moose, which is not very large; and the black moose, which grows to an enormous height. Mr. Dudley observes, that a doe or hind of the black moose kind, of the fourth year, wanted but an inch of seven feet high. All, however, of both kinds, have flat, palmed horns, not unlike the fallow-deer, only that the palm is much larger, having a short trunk at the head, and then immediately spreading above a foot broad, with a kind of small antlers, like teeth, on one of the edges. In this particular, all of the elk kind agree; as well the European elk, as the gray and the black moose-deer.

The gray moose-deer is about the size of a horse; and, although it has large buttocks, its tail is not above an inch long. As, in all of this kind, the upper lip is much longer than the under, it is said that they continue to go backward as they feed. Their nostrils are so large that a man may thrust his hand in a considerable way; and their horns are as long as those of a stag, but, as was observed, much broader.

The black moose is the enormous animal mentioned above, from eight to twelve feet high. Jocelyn, who is the first English writer that mentions it, says, that it is a goodly creature, twelve feet high, with exceeding fair horns, that have broad palms, two fathoms from the top of one horn to another. He assures us that it is a creature, or rather a monster of superfluity, and many times bigger than an English ox. This account is confirmed by Dudley; but he does not give so great an expansion to the horns, measuring them only thirty-one inches between one tip and the other; however, that such an extraordinary animal as Jocelyn describes, has actually existed, we can make no manner of doubt of, since there are horns common enough to be seen among us, twelve feet from one tip to the other.

These animals delight in cold countries, feeding upon grass in summer, and the bark of trees in winter. When the whole country is deeply covered with snow, the moose-deer herd together under the tall pine-trees, strip off the bark, and remain in that part of the forest while it yields them subsistence. It is at that time that the natives prepare to hunt them: and particularly when the sun begins to melt the snow by day, which is frozen again at night; for then the icy crust which covers the surface of the snow, is too weak to support so great a bulk, and only retards the animal's motion. When the Indians, therefore, perceive a herd of these at a distance, they immediately prepare for their pursuit, which is not, as with us, the sport of an hour, but is attended with toil, difficulty, and danger.* The timorous animal no sooner observes its enemies approach, than it immediately endeavours to escape, but sinks at every step it takes. Still, however, it pursues its way through a thousand obstacles: the snow, which is usually four feet deep, yields to its weight, and embarrasses its speed; the sharp ice wounds its feet, and its lofty horns are entangled in the branches of the forest, as it passes along. The trees, however, are broken down with ease; and wherever the moose-deer runs, it is perceived by the snapping off the branches of the trees, as thick as a man's thigh, with its horns. The chase lasts in this manner for the whole day; and sometimes he has been known to continue for two, nay three days together; for the pursuers are often not less excited by famine, than the pursued by fear. Their perseverance, however, generally succeeds; and the Indian who first comes near enough, darts his lance, with unerring aim, which sticks in the poor animal, and at first increases its efforts to escape. In this manner the moose trots heavily on (for that is its usual pace,) till its pursuers once more come up, and repeat their blow: upon this, it again summons up sufficient vigour to get a-head; but, at last, quite tired, and spent with loss of blood, it sinks, as the describer expresses it, like a ruined building, and makes the earth shake beneath its fall.

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* Phil Trans. vol. ii. p. 436.

This animal, when killed, is a very valuable acquisition to the hunters. The flesh is very well tasted, and said to be very nourishing. The hide is strong, and so thick that it has been often known to turn a musket ball, however, it is soft and pliable, and, when tanned, the leather is extremely light, yet very lasting. The fur is a light gray in some, and blackish in others; and when viewed through a microscope, appears spongy like a bulrush, and is smaller at the roots and points than in the middle; for this reason, it lies very flat and smooth, and though beaten or abused never so much, it always returns to its former state. The horns also are not less useful, being applied to all the purposes for which hartshorn is beneficial: these are different in different animals; in some they resemble entirely those of the European elk, which spread into a broad palm, with small antlers on one of the edges; in others they have a branched brow-antler between the bur and the palm, which the German elk has not; and in this they entirely agree with those whose horns are frequently dug up in Ireland. This animal is said to be troubled with the epilepsy, as it is often found to fall down when pursued, and thus becomes an easier prey; for this reason, an imaginary virtue has been ascribed to the hinder hoof, which some have supposed to be a specific against all epileptic disorders. This, however, may be considered as a vulgar error; as well as that of its curing itself of this disorder by applying the hinder hoof behind the ear. After all, this animal is but very indifferently and confusedly described by travellers; each mixing his account with something false or trivial; often mistaking some other quadruped for the elk, and confounding its history. Thus some have mistaken it for the rein-deer, which, in every thing but size, it greatly resembles; some have supposed it to be the same with the Tapurette,* from which it entirely differs; some have described it as the common red American stag, which scarcely differs from our own; and, lastly, some have confounded it with the Bubalus, which is more properly a gazelle of Africa.†

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* Condamine.

† Dapper, Description de l'Afrique, p. 17.

THE REIN-DEER.

Of all animals of the deer kind, the rein-deer is the most extraordinary and the most useful. It is a native of the icy regions of the north; and though many attempts have been made to accustom it to a more southern climate, it shortly feels the influence of the change, and in a few months declines and dies. Nature seems to have fitted it entirely to answer the necessities of that hardy race of mankind that live near the pole. As these would find it impossible to subsist among their barren snowy mountains without its aid, so this animal can live only there, where its assistance is most absolutely necessary. From it alone the natives of Lapland and Greenland supply most of their wants; it answers the purposes of a horse, to convey them and their scanty furniture from one mountain to another; it answers the purposes of a cow, in giving milk; and it answers the purposes of the sheep, in furnishing them with a warm, though a homely kind of clothing. From this quadruped alone, therefore, they receive as many advantages as we derive from three of our most useful creatures; so that Providence does not leave these poor outcasts entirely destitute, but gives them a faithful domestic, more patient and serviceable than any other in Nature.

The rein-deer resembles the American elk in the fashion of its horns. It is not easy in words to describe these minute differences; nor will the reader, perhaps, have a distinct idea of the similitude, when told that both have brow-antlers, very large, and hanging over their eyes, palmated towards the top, and bending forward like a bow. But here the similitude between these two animals ends; for, as the elk is much larger than the stag, so the rein-deer is much smaller. It is lower and stronger built than the stag; its legs are shorter and thicker, and its hoofs much broader than in that animal; its hair is much thicker and warmer; its horns much larger in proportion, and branching forward over its eyes; its ears are much larger; its pace is rather a trot than a bounding, and this it can continue for a whole day; its hoofs are cloven and moveable, so that it spreads them abroad as it goes, to prevent its sinking in the snow. When it proceeds on a journey, it lays its great horns on its back, while there are two branches which always hang over its forehead, and almost cover its face. One thing seems peculiar to this animal and the elk; which is, that as they move along, their hoofs are heard to crack with a pretty loud noise. This arises from their manner of treading; for as they rest upon their cloven hoof, it spreads on the ground, and the two divisions separate from each other, but when they lift it, the divisions close again, and strike against each other with a crack. The female also of the rein-deer has horns as well as the male, by which the species is distinguished from all other animals of the deer kind whatsoever.

When the rein-deer first shed their coat of hair, they are brown; but in proportion as summer approaches, their hair begins to grow whitish; until, at last, they are nearly gray.* They are, however, always black about the eyes The neck has long hair, hanging down, and coarser than upon any other part of the body. The feet, just at the insertion of the hoof, are surrounded with a ring of white. The hair in general stands so thick over the whole body, that if one should attempt to separate it, the skin will no where appear uncovered: whenever it falls also, it is not seen to drop from the root, as in other quadrupeds, but seems broken short near the bottom; so that the lower part of the hair is seen growing, while the upper falls away. The horns of the female are made like those of the male, except that they are smaller and less branching. As in the rest of the deer kind, they sprout from the points; and also in the beginning are furnished with a hairy crust, which supports the blood-vessels of most exquisite sensibility. The rein-deer shed their horns after rutting time, at the latter end of November; and they are not completely furnished again till towards autumn. The female always retains hers till she brings forth, and then sheds them about the beginning of November. If she be barren, however, which is not unfrequently the case, she does not shed them till winter. The castration of the rein-deer does not prevent the shedding of their horns. those which are the strongest cast them early in winter; those which are more weakly not so soon. Thus, from all these circumstances, we see how greatly this animal differs from the common stag. The female of the rein-deer has horns, which the hind is never seen to have; the rein-deer, when castrated, renews its horns, which we are assured the stag never does: it differs not less in its habits and manner of living, being tame, submissive, and patient; while the stag is wild, capricious, and unmanageable.

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* For the greatest part of this description of the rein-deer, I am obliged to Mr. Hoffberg; upon whose authority, being a native of Sweden, and an experienced naturalist, we may confidently rely.

The rein-deer, as was said, is naturally an inhabitant of the countries bordering on the arctic circle. It is not unknown to the natives of Siberia. The North Americans also hunt it under the name of the *caribou*. But in Lapland, this animal is converted to the utmost advantage; and some herdsmen of that country are known to possess above a thousand in a single herd.

Lapland is divided into two districts, the mountainous and the woody. The mountainous part of the country is at best barren and bleak, excessively cold and uninhabitable during the winter; still, however, it is the most desirable part of this frightful region, and is most thickly peopled during the summer. The natives generally reside on the declivity of the mountains, three or four cottages together, and lead a cheerful and social life. Upon the approach of winter, they are obliged to migrate into the plains below, each bringing down his whole herd, which often amounts to more than a thousand, and leading them where the pasture is in greatest plenty. The woody part of the country is much more desolate and hideous. The whole face of Nature there presents a frightful scene of trees without fruit, and plains without verdure. As far as the eye can reach, nothing is to be seen, even in the midst of summer, but barren fields, covered only with a moss, almost as white as snow; no grass, no flowery landscapes; only here and there a pine-tree, which may have escaped the frequent conflagrations by which the natives burn down their forests. But what is very extraordinary, as the whole surface of the country is clothed in white, so on the contrary, the forests seem to the last degree dark and gloomy. While one kind of moss makes the fields look as if they were covered with snow, another kind blackens over all their trees, and even hides their verdure. This moss, however, which deforms the country, serves for its only support, as upon it alone the rein-deer can subsist. The inhabitants, who, during the summer, lived among the mountains, drive down their herds in winter, and people the plains and woods below. Such of the Laplanders as inhabit the woods and the plains all the year round, live remote from each other, and having been used to solitude, are melancholy, ignorant, and helpless. They are much poorer also than the mountaineers; for, while one of those is found to possess a thousand rein-deer at a time, none of these are ever known to rear the tenth part of that number. The rein-deer makes the riches of this people; and the cold mountainous parts of the country agree best with its constitution. It is for this reason, therefore, that the mountains of Lapland are preferred to the woods; and that many claim an exclusive right to the tops of hills, covered in almost eternal snow. As soon as the summer begins to appear, the Laplander, who had fed his rein-deer upon the lower grounds during the winter, then drives them up to the mountains, and leaves the woody country, and the low pasture, which at that season are truly deplorable. The gnats bred by the sun's heat in the marshy bottoms and the weedy lakes, with which the country abounds more than any other part of the world, are all upon the wing, and fill the whole air like clouds of dust in a dry windy day. The inhabitants, at that time, are obliged to daub their faces with pitch, mixed with milk, to shield their skins from their depredations. All places are then so greatly infested, that the poor natives can scarce open their mouths without fear of suffocation; the insects enter, from their numbers and minuteness, into the nostrils and the eyes, and do not leave the sufferer a moment at his ease. But they are chiefly enemies to the rein-deer: the horns of that animal being then in their tender state, and possessed of extreme sensibility, a famished cloud of insects instantly settle upon them, and drive the poor animal almost to distraction. In this extremity there are but two remedies to which the quadruped, as well as its master, are obliged to have recourse. The one is, for both to take shelter near their cottage, where a large fire of tree-moss is prepared, which filling the whole place with smoke, keeps off the gnat, and thus by one inconvenience, expels a greater; the other is, to ascend to the highest summit of the mountains, where the air is too thin, and the weather too cold, for the gnats to come. There the rein-deer are seen to continue the whole day, although without food, rather than to venture down to the lower parts where they can have no defence against their unceasing persecutors. Besides the gnat, there is also a gadfly, that, during the summer season, is no less formidable to them. This insect is bred under their skins, where the egg has been deposited the preceding summer; and it is no sooner produced as a fly, than it again endeavours to deposit its eggs in some place similar to that from whence it came. Whenever, therefore, it appears flying over a herd of rein-deer, it puts the whole body, how numerous soever, into motion; they know their enemy, and do all they can, by tossing their horns, and running among each other, to terrify or avoid it. All their endeavours, however, are too generally without effect; the gadfly is seen to deposit its eggs, which burrowing under the skin, wound it in several places, and often bring on an incurable disorder. In the morning, therefore, as soon as the Lapland herdsman drives his deer to pasture, his greatest care is to keep them from scaling the summits of the mountains where there is no food, but where they go merely to be at ease from the gnats and gadflies that are ever annoying them. At this time there is a strong contest between the dogs and the deer; the one endeavouring to climb up against the side of the hill, and to gain those summits that are covered in eternal snows; the other forcing them down, by barking and threatening, and, in a manner, compelling them into the places where their food is in the greatest plenty. There the men and dogs confine them; guarding them with the utmost precaution the whole day, and driving them home at the proper seasons for milking.

The female brings forth in the middle of May, and gives milk till about the middle of October. Every morning and evening, during the summer, the herdsman returns to the cottage with his deer to be milked, where the women previously have kindled up a smoky fire, which effectually drives off the gnats, and keeps the rein-deer quiet while milking. The female furnishes about a pint, which, though thinner than that of the cow, is, nevertheless, sweeter, and more nourishing. This done, the herdsman drives them back to pasture; as he neither folds nor houses them, neither provides for their subsistence during the winter, nor improves their pasture by cultivation.

Upon the return of the winter, when the gnats and flies are no longer to be feared, the Laplander descends into the lower grounds; and as there are but few to dispute the possession of that desolute country, he has an extensive range to feed them in. Their chief, and almost their only food at that time, is the white moss already mentioned; which, from its being fed upon by this animal, obtains the name of the *lichen rangifcrinus.* This is of two kinds; the woody lichen, which covers almost all the desert parts of the country like snow; the other is black, and covers the branches of the trees in very great quantities. However unpleasing these may be to the spectator, the native esteems them as one of his choicest benefits, and the most indulgent gift of Nature. While his fields are clothed with moss, he envies neither the fertility nor the verdure of the more southern landscape; dressed up warmly in his deer-skin clothes, with shoes and gloves of the same materials, he drives his herds along the desert, fearless and at ease, ignorant of any higher luxury than what their milk and smoke-dried flesh affords him. Hardened to the climate, he sleeps in the midst of ice; or awaking, dozes away his time with tobacco; while his faithful dogs supply his place, and keep the herd from wandering. The deer, in the mean time, with instincts adapted to the soil, pursue their food, though covered in the deepest snow. They turn it up with their noses, like swine; and, even though its surface be frozen and stiff, yet the hide is so hardened in that part, that they easily overcome the difficulty. It sometimes, however, happens, though but rarely, that the winter commences with rain, and a frost ensuing, covers the whole country with a glazed crust of ice. Then, indeed, both the rein-deer and the Laplander are undone; they have no provisions laid up in case of accident, and the only resource is to cut down the large pine-trees that are covered with moss, which furnishes but a scanty supply; so that the greatest part of the herd is then seen to perish without a possibility of assistance. It sometimes also happens, that even this supply is wanting; for the Laplander often burns down his woods, in order to improve and fertilize the soil which produces the moss, upon which he feeds his cattle.

In this manner, the pastoral life is still continued near the pole; neither the coldness of the winter, nor the length of the nights; neither the wildness of the forests, nor the vagrant disposition of the herd, interrupt the even tenour of the Laplander's life. By night and day he is seen attending his favourite cattle, and remains unaffected, in a season which would be speedy death to those bred up in a milder climate. He gives himself no uneasiness to house his herds, or to provide a winter subsistence for them; he is at the trouble neither of manuring his grounds, nor bringing in his harvest; he is not the hireling of another's luxury; all his labours are to obviate the necessities of his own situation; and these he undergoes with cheerfulness, as he is sure to enjoy the fruits of his own industry. If, therefore, we compare the Laplander with the peasant of more southern climates, we shall have little reason to pity his situation; the climate in which he lives is rather terrible to us than to him; and as for the rest, he is blessed with liberty, plenty, and ease. The rein-deer alone supplies him with all the wants of life, and some of the conveniencies; serving to show how many advantages Nature is capable of supplying, when necessity gives the call. Thus the poor, little, helpless native, who was originally, perhaps, driven by fear or famine into those inhospitable climates, would seem, at first view, to be the most wretched of mankind: but it is far otherwise; he looks round among the few wild animals that his barren country can maintain, and singles out one from among them, and that of a kind which the rest of mankind have not thought worth taking from a state of nature; this he cultivates, propagates, and multiplies; and from this alone derives every comfort that can soften the severity of his situation.

The rein-deer of this country are of two kinds, the wild and the tame. The wild are larger and stronger, but more mischievous than the others. Their breed, however, is preferred to that of the tame; and the female of the latter is often sent into the woods, from whence she returns home impregnated by one of the wild kind. These are fitter for drawing the sledge, to which the Laplander accustoms them betimes, and yokes them to it by a strap, which goes round the neck, and comes down between their legs. The sledge is extremely light, and shod at the bottom with the skin of a young deer, the hair turned to slide on the frozen snow. The person who sits on this, guides the animal with a cord, fastened round the horns, and encourages it to proceed with his voice, and drives it with a goad. Some of the wild breed, though by far the strongest, are yet found refractory, and often turn upon their drivers; who have then no other resource but to cover themselves with the sledge, and let the animal vent its fury upon that. But it is otherwise with those that are tame; no creature can be more active, patient, and willing: when hard pushed they will trot nine or ten Swedish miles, or between fifty and sixty English miles, at one stretch. But, in such a case, the poor obedient creature fatigues itself to death, and, if not prevented by the Laplander, who kills it immediately, it will die a day or two after

In general, they can go about thirty miles without halting, and this without any great or dangerous efforts. This, which is the only manner of travelling in that country, can be performed only in winter, when the snow is glazed over with ice; and although it be a very speedy method of conveyance, yet it is inconvenient, dangerous, and troublesome.

In order to make these animals more obedient, and more generally serviceable, they castrate them: this operation the Laplanders perform with their teeth; these become sooner fat when taken from labour; and they are found to be stronger in drawing the sledge. There is usually one male left entire for every six females; these are in rut from the Feast of St. Matthew to about Michaelmas. At this time, their horns are thoroughly burnished, and their battles among each other are fierce and obstinate. The females do not begin to breed till they are two years old; and then they continue regularly breeding every year till they are superannuated. They go with young above eight months, and generally bring forth two at a time. The fondness of the dam for her young is very remarkable; it often happens that when they are separated from her, she will return from pasture, keep calling round the cottage for them, and will not desist until, dead or alive, they are brought and laid at her feet. They are at first of a light brown; but they become darker with age; and at last the old ones are of a brown, almost approaching to blackness. The young follow the dam for two or three years; but they do not acquire their full growth until four. They are then broke in, and managed for drawing the sledge; and they continue serviceable for four or five years longer. They never live above fifteen or sixteen years; and when they arrive at the proper age, the Laplander generally kills them for the sake of their skins and their flesh. This he performs by striking them on the back of the neck with his knife into the spinal marrow; upon which they instantly fall, and he then cuts the arteries that lead to the heart, and lets the blood discharge itself into the cavity of the breast.

There is scarce any part of this animal that is not converted to its peculiar uses. As soon as it begins to grow old, and some time before the rut, it is killed, and the flesh dried in the air. It is also sometimes hardened with smoke, and laid up for travelling provision, when the natives migrate from one part of the country to another. During the winter, the rein-deer are slaughtered as sheep with us; and every four persons in the family are allowed one rein-deer for their week's subsistence. In spring they spare the herd as much as they can, and live upon fresh fish. In summer, the milk and curd of the rein-deer makes their chief provision; and, in autumn, they live wholly upon fowls, which they kill with a cross-bow, or catch in springes. Nor is this so scanty an allowance; since, at that time, the sea-fowls come in such abundance that their ponds and springs are covered over. These are not so shy as with us, but yield themselves an easy prey. They are chiefly allured to those places by the swarms of gnats which infest the country during summer, and now repay the former inconveniences, by inviting such numbers of birds as supply the natives with food a fourth part of the year, in great abundance.

The milk, when newly taken, is warmed in a caldron, and thickened with rennet; and then the curd is pressed into cheeses, which are little and well tasted. These are never found to breed mites as the cheese of other countries; probably because the mite-fly is not to be found in Lapland. The whey which remains is warmed up again, and becomes of a consistence as if thickened with the white of eggs. Upon this the Laplanders feed during the summer; it is pleasant and well tasted, but not very nourishing. As to butter, they very seldom make any, because the milk affords but a very small quantity, and this, both in taste and consistence, is more nearly resembling to suet. They never keep their milk till it turns sour; and do not dress it into the variety of dishes which the more southern countries are known to do. The only delicacy they make from it is with wood-sorrel, which being boiled up with it, and coagulating, the whole is put into casks, or deer skins, and kept under ground to be eaten in winter.

The skin is even a more valuable part of this animal than either of the former. From that part of it which covered the head and feet, they make their strong snow-shoes with the hair on the outside. Of the other parts they compose their garments, which are extremely warm, and which cover them all over. The hair of these also is on the outside; and they sometimes line them with the fur of the glutton, or some other warm-furred animal of that climate. These skins also serve them for beds. They spread them on each side of the fire, upon some leaves of the dwarf birch-tree, and in this manner lie both soft and warm. Many garments made of the skin of the rein-deer are sold every year to the inhabitants of the more southern parts of Europe; and they are found so serviceable in keeping out the cold, that even people of the first rank are known to wear them.

In short, no part of this animal is thrown away as useless. The blood is preserved in small casks, to make sauce with the marrow in spring. The horns are sold to be converted into glue. The sinews are dried, and divided so as to make the strongest kind of sewing thread, not unlike catgut. The tongues, which are considered as a great delicacy, are dried, and sold into the more southern provinces. The intestines themselves are washed like our tripe, and in high esteem among the natives. Thus the Laplander finds all his necessities amply supplied from this single animal, and he who has a large herd of these animals has no idea of higher luxury.

But although the rein-deer be a very hardy and vigorous animal, it is not without its diseases. I have already mentioned the pain it feels from the gnat, and the apprehensions it is under from the gadfly. Its hide is often found pierced in a hundred places, like a sieve, from this insect, and not a few die in their third year from this very cause. Their teats also are subject to cracking, so that blood comes instead of milk. They sometimes take a loathing for their food; and, instead of eating, stand still and chew the cud. They are also troubled with a vertigo, like the elk, and turn round often till they die. The Laplander judges of their state by the manner of their turning. If they turn to the right, he judges their disorder but slight; if they turn to the left, he deems it incurable. The rein-deer are also subject to ulcers near the hoof, which unqualifies them for travelling, or keeping with the herd But the most fatal disorder of all is that which the natives call the *suddataka*, which attacks this animal at all seasons of the year The instant it is seized with this disease, it begins to breathe with great difficulty; its eyes begin to stare, and its nostrils to expand. It acquires also an unusual degree of ferocity, and attacks all it meets indiscriminately. Still, however, it continues to feed as if in health, but is not seen to chew the cud, and it lies down more frequently than before. In this manner it continues, every day consuming and growing more lean, till at last it dies from mere inanition: and not one of these that are attacked with this disorder, are ever found to recover. Notwithstanding it is but very lately known in that part of the world; although, during the last ten or fifteen years it has spoiled whole provinces of this necessary creature. It is contagious; and the moment the Laplander perceives any of his herd infected, he hastens to kill them immediately before it spreads any farther. When examined internally, there is a frothy substance found in the brain, and round the lungs; the intestines are lax and flabby, and the spleen is diminished almost to nothing. The Laplander's only cure in all these disorders, is to anoint the animal's back with tar; if this does not succeed, he considers the disease as beyond the power of art; and, with his natural phlegm, submits to the severities of Fortune.

Besides the internal maladies of this animal, there are some external enemies which it has to fear. The bears now and then make depredations upon the herd; but of all their persecutors, the creature called the *glutton* is the most dangerous and the most successful. The war between these is carried on not less in Lapland than in North America, where the rein-deer is called the *caribou*, and the *glutton* the *carcajou*. This animal, which is not above the size of a badger, waits whole weeks together for its prey, hid in the branches of some spreading tree; and when the wild rein-deer passes underneath, it instantly drops down upon it, fixing its teeth and claws into the neck, just behind the horns. It is in vain that the wounded animal then flies for protection, that it rustles among the branches of the forest, the glutton still holds its former position, and, although it often loses a part of its skin and flesh, which are rubbed off against the trees, yet it still keeps fast, until its prey drops with fatigue and loss of blood. The deer has but one only method of escape, which is by jumping into the water: that element its enemy cannot endure; for, as we are told, it quits its hold immediately, and then thinks only of providing for its own proper security

BOOK III.

QUADRUPEDS OF THE HOG KIND

CHAPTER I.

INTRODUCTION.

Animals of the hog kind seem to unite in themselves all those distinctions by which others are separated. They resemble those of the horse kind in the number of their teeth, which in all amount to forty four, in the length of their head, and in having but a single stomach They resemble the cow kind in their cloven hoofs and the position of their intestines; and they resemble those of the claw-footed kind in their appetite for flesh, in their not chewing the cud, and in their numerous progeny. Thus this species serves to fill up that chasm which is found between the carnivorous kinds and those that live upon grass; being possessed of the ravenous appetites of the one, and the inoffensive nature of the other. We may consider them, therefore, as of a middle nature, which we can refer neither to the rapacious nor the peaceful kinds, and yet partaking somewhat of the nature of both. Like the rapacious kinds, they are found to have short intestines; their hoofs also, though cloven to the sight, will, upon anatomical inspection, appear to be supplied with bones like beasts of prey; and the number of their teats also increase the similitude; on the other hand, in a natural state they live upon vegetables, and seldom seek after animal food, except when urged by necessity. They offend no other animal of the forest, at the same time that they are furnished with arms to terrify the bravest.

THE WILD BOAR,

Which is the original of all the varieties we find in this creature, is by no means so stupid nor so filthy an animal as that we have reduced to tameness; he is much smaller than the tame hog, and does not vary in his colour as those of the domestic kind do, but is always found of an iron gray, inclining to black; his snout is much longer than that of the tame hog, and the ears are shorter, rounder, and black; of which colour are also the feet and the tail. He roots the ground in a different manner from the common hog; for as this turns up the earth in little spots here and there, so the wild boar ploughs it up like a furrow, and does irreparable damage in the cultivated lands of the farmer. The tusks also of this animal are larger than in the tame breed, some of them being seen almost a foot long.* These, as is well known, grow from both the under and upper jaw, bend upwards circularly, and are exceedingly sharp at the points. They differ from the tusks of the elephant in this, that they never fall; and it is remarkable of all the hog kind that they never shed their teeth as other animals are seen to do. The tusks of the lower jaw are always the most to be dreaded, and are found to give very terrible wounds.

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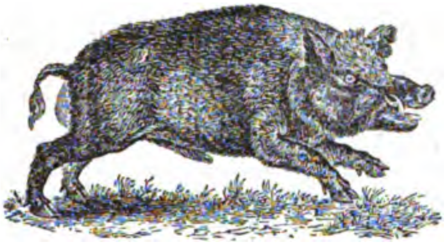
* Buffon. vol. ix. p. 147.

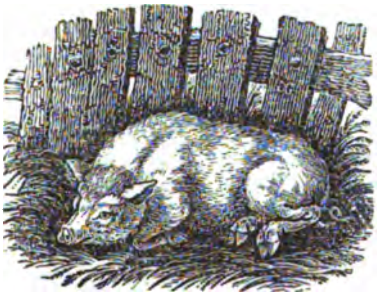
The wild boar can properly be called neither a solitary nor a gregarious animal. The three first years the whole litter follows the sow and the family lives in a herd together. They are then called beasts of company, and unite their common forces against the invasions of the wolf, or the more formidable beasts of prey. Upon this their principal safety, while young, depends, for when attacked they give each other mutual assistance, calling to each other with a very loud and fierce note; the strongest face the danger; they form a ring, and the weakest fall into the centre. In this position few ravenous beasts dare venture to attack them, but pursue the chase where there is less resistance and danger. However, when the wild boar is come to a state of maturity, and when conscious of his own superior strength, he then walks the forest alone and fearless. At that time he dreads no single creature, nor does he turn out of his way even for man himself. He does not seek danger, and he does not much seem to avoid it.

This animal is therefore seldom attacked, but at a disadvantage, either by numbers, or when found sleeping by moon-light. The hunting the wild boar is one of the principal amusements of the nobility in those countries where it is to be found. The dogs provided for this sport are of the slow heavy kind. Those used for hunting the stag, or the roe-buck, would be very improper, as they would too soon come up with their prey; and, instead of a chase, would only furnish out an engagement. A small mastiff is therefore chosen; nor are the hunters much mindful of the goodness of their nose, as the wild boar leaves so strong a scent, that it is impossible for them to mistake its course. They never hunt any but the largest and the oldest, which are known by their tracks. When the boar is *rear'd*, as is the expression for driving him from his covert, he goes slowly and uniformly forward, not much afraid, nor very far before his pursuers. At the end of every half mile, or thereabouts, he turns round, stops till the hounds come up, and offers to attack them. These, on the other hand, knowing their danger, keep off, and bay him at a distance. After they have for a while gazed upon each other with mutual animosity, the boar again slowly goes on his course, and the dogs renew their pursuit. In this manner the charge is sustained, and the chase continues till the boar is quite tired, and refuses to go any farther. The dogs then attempt to close in upon him from behind; those which are young, fierce, and unaccustomed to the chase, are generally the foremost, and often lose their lives by their ardour. Those which are older and better trained are content to wait until the hunters come up, who strike at him with their spears, and, after several blows, despatch or disable him. The instant the animal is killed, they cut off the testicles, which would otherwise give a taint to the flesh; and the huntsmen celebrate the victory with their horns.

Peccary p. 93.



Wild Boar, p. 89.



Hog, p. 91.

To face p. 90, vol. ii.

THE HOG,

In a natural state, is found to feed chiefly upon roots and vegetables t seldom attacks any other animal, being content with such provisions as it procures without danger. Whatever animal happens to die in the forest, or is so wounded that it can make no resistance, becomes a prey to the hog, who seldom refuses animal food, how putrid soever, although it is never at the pains of taking or procuring it alive. For this reason, it seems a glutton rather by accident than choice, content with vegetable food, and only devouring flesh when pressed by necessity, and when it happens to offer. Indeed, if we behold the hog in its domestic state, it is the most sordid and brutal animal in Nature.* The awkwardness of its form seems to influence its appetites: and all its sensations are as gross as its shapes are unsightly. It seems possessed only of an insatiable desire of eating; and it seems to make choice only of what other animals find the most offensive. But we ought to consider that the hog with us is in an unnatural state, and that it is in a manner compelled to feed in this filthy manner from wanting that proper nourishment which it finds in the forest. When in a state of wildness, it is of all other quadrupeds the most delicate in the choice of what vegetable it shall feed on, and rejects a greater number than any of the rest. The cow, for instance, as we are assured by Linnæus, eats two hundred and seventy-six plants, and rejects two hundred and eighteen; the goat eats four hundred and forty-nine, and rejects a hundred and twenty-six; the sheep eats three hundred and eighty-seven, and rejects a hundred and forty-one; the horse eats two hundred and sixty-two, and rejects two hundred and twelve; but the hog, more nice in its provision than any of the former, eats but seventy-two plants, and rejects a hundred and seventy-one. The indelicacy of this animal is, therefore, rather in our apprehensions than in its nature; since we find it makes a very distinguishing choice in the quality of its food; and if it does not reject animal putrefaction, it may be because it is abridged in that food which is most wholesome and agreeable to it in a state of nature. This is certain, that its palate is not insensible to the difference of eatables; for, where it finds variety, it will reject the worst, with as distinguishing a taste as any other quadruped whatsoever.† In the orchards of peach-trees in North America, where the hog has plenty of delicious food, it is observed, that it will reject the fruit that has lain but a few hours on the ground, and continue on the watch whole hours together for a fresh wind-fall.

However, the hog is naturally formed in a more imperfect manner than the other animals that we have rendered domestic around us, less active in its motions, less furnished with instinct in knowing what to pursue or avoid. Without attachment, and incapable of instruction, it continues, while it lives, a useless, or rather a rapacious dependant. The coarseness of its hair, and the thickness of its hide, together with the thick coat of fat that lies immediately under the skin, render it insensible to blows, or rough usage. Mice have been known to burrow in the back of these animals while fattening in the sty,* without their seeming to perceive it. Their other senses seem to be in tolerable perfection; they scent the hounds at a distance; and, as we have seen, they are not insensible in the choice of their provisions.

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* Buffon, vol. ix. p. 14

† British Zoology, vol. i. p. 42.

The hog is, by nature, stupid, inactive, and drowsy; if undisturbed, it would sleep half its time; but it is frequently awaked by the calls of appetite, which when it has satisfied, it goes to rest again. Its whole life is thus a round of sleep and gluttony; and if supplied with sufficient food, it soon grows unfit even for its own existence; its flesh becomes a greater load than its legs are able to support, and it continues to feed lying down, or kneeling, a helpless instance of indulged sensuality The only time it seems to have passions of a more active nature, are, when it is incited by venery, or when the wind blows with any vehemence. Upon this occasion, it is so agitated as to run violently towards its sty, screaming horribly at the same time, which seems to argue that it is naturally fond of a warm climate. It appears also to foresee the approach of bad weather, bringing straw to its stye in its mouth, preparing a bed, and hiding itself from the impending storm. Nor is it less agitated, when it hears any of its kind in distress: when a hog is caught in a gate, as is often the case, or when it suffers any of the usual domestic operations of ringing or spaying, all the rest are then seen to gather round it, to lend their fruitless assistance, and to sympathize with its sufferings. They have also been known to gather round a dog that had teazed them, and kill him upon the spot.

Most of the diseases of this animal arise from intemperance; measles, imposthumes, and scrofulous swellings, are reckoned among the number. It is thought by some that they wallow in the mire to destroy a sort of louse, or insect, that is often found to infest them; however, they are generally known to live, when so permitted, to eighteen or twenty years; and the females produce till the age of fifteen. As they produce from ten to twenty young at a litter, and that twice a year, we may easily compute how numerous they would shortly become, if not diminished by human industry. In the wild state they are less prolific; and the sow of the woods brings forth but once a year, probably because exhausted by rearing up her former numerous progeny.

It would be superfluous to dwell longer upon the nature and qualities of an animal too well known to need a description: there are few, even in cities, who are unacquainted with its uses, its appetites, and way of living. The arts of fattening, rearing, guarding, and managing hogs, fall more properly under the cognizance of the farmer than the naturalist; they make a branch of domestic economy, which, properly treated, may be extended to a great length; but the history of Nature ought always to end where that of Art begins. It will be sufficient, therefore, to observe, that the wild boar was formerly a native of our country, as appears from the laws of Hoeldda,† the famous Welch legislator, who permitted his grand huntsman to chase that animal from the middle of November to the beginning of December. William the Conqueror also punished such as were convicted of killing the wild boar in his forests, with the loss of their eyes. At present, the whole wild breed is extinct; but no country makes greater use of the tame kinds, as their flesh, which bears salt better than that of any other animal, makes a principal part of the provisions of the British navy.

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* Buffon

† British Zoology, vol. i. p. 44.

As this animal is a native of almost every country, there are some varieties found in the species. That which we call the East-India breed, is lower, less furnished with hair, is usually black, and has the belly almost touching the ground; it is now common in England; it fattens more easily than the ordinary kinds, and makes better bacon.

There is a remarkable variety of this animal about Upsal,* which is single-hoofed, like the horse; but in no other respect differing from the common kinds. The authority of Aristotle, who first made mention of this kind, has been often called into question; some have asserted, that such a quadruped never existed, because it happened not to fall within the sphere of their own confined observation; however, at present, the animal is too well known to admit of any doubt concerning it. The hog, common in Guinea, differs also in some things from our own; though shaped exactly as ours, it is of a reddish colour, with long ears, which end in a sharp point, and a tail which hangs down to the pastern; the whole body is covered with short red shining hair, without any bristles, but pretty long near the tail. Their flesh is said to be excellent, and they are very tame.

All these, from their near resemblance to the hog, may be considered as of the same species; the East Indian hog, we well know, breeds with the common kind; whether the same obtains between it and those of Upsal and Guinea, we cannot directly affirm; but where the external similitude is so strong, we may be induced to believe that the appetites and habits are the same. It is true, we are told, that the Guinea breed will not mix with ours, but keep separate, and herd only together: however, this is no proof of their diversity, since every animal will prefer its own likeness in its mate; and they will then only mix with another sort, when deprived of the society of their own. These, therefore, we may consider as all of the hog kind; but there are other quadrupeds, that, in general, resemble this species, which, nevertheless, are very distinct from them. Travellers, indeed, from their general form, or from their habits and way of living, have been content to call these creatures hogs also; but upon a closer inspection, their differences are found to be such as entirely to separate the kinds, and make each a distinct animal by itself.

CHAPTER II.

THE PECCARY, OR TAJACU.

THAT animal which of all others most resembles the hog, and yet is of a formation very distinct from it, is called the *peccary*, or *tajacu*. It is a native of America, and found there, in such numbers, that they are seen in herds of several hundreds together, grazing among the woods, and inoffensive, except when offended.

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* Amœnit. Acad. vol. v. p. 465.

The peccary, at first view, resembles a small hog; the form of its body, the shape of its head, the length of its snout, and the form of its legs, are entirely alike: however, when we come to examine it nearer, the differences begin to appear. The body is not so bulky; its legs not so long; its bristles much thicker and stronger than those of the hog, resembling rather the quills of a porcupine, than hair; instead of a tail, it has only a little fleshy protuberance, which does not even cover its posteriors; but that which is still more extraordinary, and in which it differs from all other quadrupeds whatsoever, is, that it has got upon its back a lump, resembling the navel in other animals, which is found to separate a liquor of a very strong smell. The peccary is the only creature that has those kinds of glands which discharge the musky substance on that part of its body. Some have them under the belly, and others under the tail; but this creature, by a conformation peculiar to itself, has them on its back. This lump, or navel, is situated on that part of the back which is over the hinder legs; it is, in general, so covered with long bristles, that it cannot be seen, except they be drawn aside. A small space then appears, that is almost bare, and only beset with a few short fine hairs. In the middle it rises like a lump; and in this there is an orifice, into which one may thrust a common goose quill. This hole or bag is not above an inch in depth; and round it, under the skin, are situated a number of small glands, which distil a whitish liquor, in colour and substance resembling that obtained from the civet animal. Perhaps it was this analogy, that led Dr. Tyson to say, that it smelt agreeably also, like that perfume. But this Mr. Buffon absolutely denies; affirming, that the smell is at every time, and in every proportion, strong and offensive, and to this I can add my own testimony, if that able naturalist should want a voucher.

But, to be more particular in the description of the other parts of this quadruped; the colour of the body is grizzly, and beset with bristles, thicker and stronger than those of a common hog; though not near so thick as those of a porcupine, they resemble, in this respect, that they are variegated with black and white rings. The belly is almost bare; and the short bristles on the sides, gradually increase in length, as they approach the ridge of the back, where some are five inches long. On the head also between the ears, there is a large tuft of bristles that are chiefly black. The ears are about two inches and a half long, and stand upright; and the eyes resemble those of a common hog, only they are smaller. From the lower corner of the eye to the snout, is usually six inches; and the snout itself is like that of a hog's, though it is but small. One side of the lower lip is generally smooth, by the rubbing of the tusk of the upper jaw. The feet and hoofs are perfectly like those of a common hog; but, as was already observed, it has no tail. There are some anatomical differences in its internal structure from that of the common hog. Dr. Tyson was led to suppose, that it had three stomachs; whereas the hog has but one: however, in this he was deceived, as Mr. Daubenton has plainly shown, that the stomach is only divided by two closings, which gives it the appearance as if divided into three; and there is no conformation that prevents the food in any part of it, from going or returning to any other.

The peccary may be tamed like the hog, and has pretty nearly the same habits and natural inclinations. It feeds upon the same aliments; its flesh, though drier and leaner than that of the hog, is pretty good eating; it is improved by castration; and, when killed, not only the parts of generation must be taken instantly away, but also the navel on the back, with all the glands that contribute to its supply. If this operation be deferred for only half an hour, the flesh becomes utterly unfit to be eaten.

The peccary is extremely numerous in all the parts of Southern America. They go in herds of two or three hundred together; and unite, like hogs, in each other's defence. They are particularly fierce when their young are attempted to be taken from them. They surround the plunderer, attack him without fear, and frequently make his life pay the forfeit of his rashness. When any of the natives are pursued by a herd in this manner, they frequently climb a tree to avoid them; while the peccaries gather round the root, threaten with their tusks, and their rough bristles standing erect, as in the hog kind, they assume a very terrible appearance. In this manner they remain at the foot of the tree for hours together; while the hunter is obliged to wait patiently, and not without apprehensions, until they think fit to retire.

The peccary is rather fond of the mountainous parts of the country, than the lowlands; it seems to delight neither in the marshes nor the mud, like our hogs; it keeps among the woods, where it subsists upon wild fruits, roots, and vegetables; it is also an unceasing enemy to the lizard, the toad, and all the serpent kinds, with which these uncultivated forests abound. As soon as it perceives a serpent, or a viper, it at once seizes it with its fore hoofs and teeth, skins it in an instant, and devours the flesh. This is often seen, and may, therefore, be readily credited: but as to its applying to a proper vegetable immediately after, as an antidote to the poison of the animal it had devoured, this part of the relation we may very well suspect. The flesh, neither of the toad nor viper, as every one knows, are poisonous; and, therefore, there is no need of a remedy against their venom. Ray gives no credit to either part of the account; however, we can have no reason to disbelieve that it feeds upon toads and serpents; it is only the making use of a vegetable antidote that appears improbable, and which perhaps had its rise in the ignorance and credulity of the natives.

The peccary, like the hog, is very prolific; the young ones follow the dam, and do not separate till they have come to perfection. If taken at first, they are very easily tamed, and soon lose all their natural ferocity, however, they never show any remarkable signs of docility, but continue stupid and rude, without attachment, or even seeming to know the hand that feeds them. They only continue to do no mischief; and they may be permitted to run tame, without apprehending any dangerous consequences. They seldom stray far from home; they return of themselves to the sty; and do not quarrel among each other, except when they happen to be fed in common. At such times, they have an angry kind of growl, much stronger and harsher than that of a hog; but they are seldom heard to scream as the former, only now and then, when frighted, or irritated, they have an abrupt angry manner of blowing like the boar.

The peccary, though like the hog in so many various respects, is, call the *suddataka*, which attacks this animal at all seasons of the year The instant it is seized with this disease, it begins to breathe with great difficulty; its eyes begin to stare, and its nostrils to expand. It acquires also an unusual degree of ferocity, and attacks all it meets indiscriminately. Still, however, it continues to feed as if in health, but is not seen to chew the cud, and it lies down more frequently than before. In this manner it continues, every day consuming and growing more lean, till at last it dies from mere inanition: and not one of these that are attacked with this disorder, are ever found to recover. Notwithstanding it is but very lately known in that part of the world; although, during the last ten or fifteen years it has spoiled whole provinces of this necessary creature. It is contagious; and the moment the Laplander perceives any of his herd infected, he hastens to kill them immediately before it spreads any farther. When examined internally, there is a frothy substance found in the brain, and round the lungs; the intestines are lax and flabby, and the spleen is diminished almost to nothing. The Laplander's only cure in all these disorders, is to anoint the animal's back with tar; if this does not succeed, he considers the disease as beyond the power of art; and, with his natural phlegm, submits to the severities of Fortune.

Besides the internal maladies of this animal, there are some external enemies which it has to fear. The bears now and then make depredations upon the herd; but of all their persecutors, the creature called the *glutton* is the most dangerous and the most successful. The war between these is carried on not less in Lapland than in North America, where the rein-deer is called the *caribou*, and the *glutton* the *carcajou*. This animal, which is not above the size of a badger, waits whole weeks together for its prey, hid in the branches of some spreading tree; and when the wild rein-deer passes underneath, it instantly drops down upon it, fixing its teeth and claws into the neck, just behind the horns. It is in vain that the wounded animal then flies for protection, that it rustles among the branches of the forest, the glutton still holds its former position, and, although it often loses a part of its skin and flesh, which are rubbed off against the trees, yet it still keeps fast, until its prey drops with fatigue and loss of blood. The deer has but one only method of escape, which is by jumping into the water: that element its enemy cannot endure; for, as we are told, it quits its hold immediately, and then thinks only of providing for its own proper security

BOOK III.

QUADRUPEDS OF THE HOG KIND

CHAPTER I.

INTRODUCTION.

Animals of the hog kind seem to unite in themselves all those distinctions by which others are separated. They resemble those of the horse kind in the number of their teeth, which in all amount to forty four, in the length of their head, and in having but a single stomach They resemble the cow kind in their cloven hoofs and the position of their intestines; and they resemble those of the claw-footed kind in their appetite for flesh, in their not chewing the cud, and in their numerous progeny. Thus this species serves to fill up that chasm which is found between the carnivorous kinds and those that live upon grass; being possessed of the ravenous appetites of the one, and the inoffensive nature of the other. We may consider them, therefore, as of a middle nature, which we can refer neither to the rapacious nor the peaceful kinds, and yet partaking somewhat of the nature of both. Like the rapacious kinds, they are found to have short intestines; their hoofs also, though cloven to the sight, will, upon anatomical inspection, appear to be supplied with bones like beasts of prey; and the number of their teats also increase the similitude; on the other hand, in a natural state they live upon vegetables, and seldom seek after animal food, except when urged by necessity. They offend no other animal of the forest, at the same time that they are furnished with arms to terrify the bravest.

THE WILD BOAR,

Which is the original of all the varieties we find in this creature, is by no means so stupid nor so filthy an animal as that we have reduced to tameness; he is much smaller than the tame hog, and does not vary in his colour as those of the domestic kind do, but is always found of an iron gray, inclining to black; his snout is much longer than that of the tame hog, and the ears are shorter, rounder, and black; of which colour are also the feet and the tail. He roots the ground in a different manner from the common hog; for as this turns up the earth in little spots here and there, so the wild boar ploughs it up like a furrow, and does irreparable damage in the cultivated lands of the farmer. The tusks also of this animal are larger than in the tame breed, some of them being seen almost a foot long.* These, as is well known, grow from both the under and upper jaw, bend upwards circularly, and are exceedingly sharp at the points. They differ from the tusks of the elephant two lower stand in the jaw as they are seen to do in that animal; but the two upper rise from the upper jaw, rather like horns than teeth; and, bending upwards and backwards, sometimes have their points directed to the animal's eyes, and are often fatal by growing into them. Were it not that the babyrouessa has two such large teeth underneath we might easily suppose the two upper to be horns; and, in fact, their sockets are directed upwards; for which reason, Dr. Grew was of that opinion. But as the teeth of both jaws are of the same consistence, and as they both grow out of sockets in the same manner, the analogy between both is too strong not to suppose them of the same nature. The upper teeth, when they leave the socket, immediately pierce the upper lips of the animal, and grow as if they immediately went from its cheek. The tusks in both jaws are of a very fine ivory, smoother and whiter than that of the elephant, but not so hard or serviceable.

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* Buffon, vol. ix. p. 147.

These enormous tusks give this animal a very formidable appearance; and yet it is thought to be much less dangerous than the wild boar.* Like animals of the hog kind, they go together in a body, and are often seen in company with the wild boar, with which, however, they are never known to engender. They have a very strong scent, which discovers them to the hounds; and, when pursued, they growl dreadfully, often turning back upon the dogs, and wounding them with the tusks of the lower jaw, for those of the upper are rather an obstruction than a defence. They run much swifter than the boar, and have a more exquisite scent, winding the men and the dogs at a great distance. When hunted closely, they generally plunge themselves into the sea, where they swim with great swiftness and facility, diving, and rising again at pleasure; and in this manner they most frequently escape their pursuers. Although fierce and terrible when offended, yet they are peaceable and harmless when unmolested. They are easily tamed, and their flesh is good to be eaten; but it is said to putrefy in a very short time. They have a way of reposing themselves different from most other animals of the larger kind; which is by hitching one of their upper tusks on the branch of a tree, and then suffering their whole body to swing down at ease. Thus suspended from a tooth, they continue the whole night quite secure, and out of the reach of such animals as hunt them for prey.

The babyrouessa, though by its teeth and tusks it seems fitted for a state of hostility, and probably is carnivorous, yet, nevertheless, seems chiefly to live upon vegetables and the leaves of trees. It seldom seeks to break into gardens, like the boar, in order to pillage the more succulent productions of human industry, but lives remote from mankind, content with coarser fare and security. It has been said, that it was only to be found in the island of Borneo, but this is a mistake, as it is well known in many other parts both of Asia and Africa, as at the Celebes, Estrila, Senegal, and Madagascar.†

Such are the animals of the hog kind, which are not distinctly known; and even all these, as we see, have been but imperfectly examined or described. There are some others of which we have still more imper fect notices; such as the waree, a hog of the Isthmus of Darien, described by Wafer, with large tusks, small ears, and bristles like a coarse fur all over the body. This, however, may be the European hog, which has run wild in that part of the new world, as no other traveller has taken notice of the same. The Canary boar seems different from other animals of this kind, by the largeness of its tusks; and, as is judged from the skeleton, by the aperture of its nostrils, and the number of its grinders. I cannot conclude this account of those animals that are thus furnished with enormous tusks, without observing that there is a strong consent between these and the parts of generation. When castrated, it is well known that the tusks grow much smaller, and are scarce seen to appear without the lips; but what is still more remarkable, is, that in a boar, if the tusks by any accident or design be broke away, the animal abates of its fierceness and venery, and it produces nearly the same effect upon its constitution, as if castration had actually taken place.*

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* Buffon, vol. xxv. p. 179.

† Anderson's Natural History of Greenland.

* Lisle's Husbandry, vol. ii. p. 239.

BOOK IV.

CARNIVOROUS ANIMALS.

CHAPTER I.

ANIMALS OF THE CAT KIND.

We have hitherto been describing a class of peaceful and harmless animals, that serve as the instruments of man's happiness, or at least, that do not openly oppose him.—We come now to a bloody and unrelenting tribe, that disdain to own his power, and carry on unceasing hostilities against him. All the class of the cat kind are chiefly distinguished by their sharp and formidable claws, which they can hide and extend at pleasure. They lead a solitary, ravenous life, neither uniting for their mutual defence, like vegetable feeders, nor for their mutual support, like those of the dog kind. The whole of this cruel and ferocious tribe seek their food alone; and, except at certain seasons, are even enemies to each other. The dog, the wolf, and the bear, are sometimes known to live upon vegetables or farinaceous food; but all of the cat kind, such as the lion, the tiger, the leopard, and the ounce, devour nothing but flesh, and starve upon any other provision.

They are, in general, fierce, rapacious, subtle, and cruel, unfit for society among each other, and incapable of adding to human happiness. However, it is probable that even the fiercest could be rendered domestic, if man thought the conquest worth the trouble. Lions have been yoked to the chariots of conquerors, and tigers have been taught to tend those herds which they are known at present to destroy; but these services are not sufficient to recompense for the trouble of their keeping; so that ceasing to be useful, they continue to be noxious, and become rebellious subjects because not taken under equal protection with the rest of the brute creation.

Other tribes of animals are classed with difficulty; having often but few points of resemblance; and, though alike in form, have different dispositions, and different appetites. But all those of the cat kind, although differing in size, or in colour, are yet nearly allied to each other; being equally fierce, rapacious, and artful; and he that has seen one has seen all. In other creatures there are many changes wrought by human assiduity; the dog, the hog, or the sheep, are altered in their natures and forms, just as the necessities or the caprice of mankind have found fitting; but all of this kind are inflexible in their forms, and wear the print of their natural wildness strong upon them. The dogs or cows vary in different countries, but lions or tigers are still found the same; the very colour is nearly alike in all; and the slightest alterations are sufficient to make a difference in the kinds, and to give the animal a different denomination.

The cat kind are not less remarkable for the sharpness and strength of their claws, which thrust forth from their sheath when they seize their prey, than for the shortness of their snout, the roundness of their head, and the large whiskers which grow on the upper lip. Their teeth also, which amount to the number of thirty, are very formidable, but rather calculated for tearing their prey than for chewing it; for this reason they feed but slowly: and while they eat, generally continue growling, to deter others from taking a share. In the dog kind, the chief power lies in the under jaw, which is long, and furnished with muscles of amazing strength; but in these the greatest force lies in the claws, which are extended with great ease, and their gripe is so tenacious that nothing can open it. The hinder parts in all these animals are much weaker than those before; and they seem less made for strength than agility. Nor are they endued with the swiftness of most other animals; but generally owe their subsistence rather to catching their prey by surprise than by hunting it fairly down. They all seize it with a bound, at the same time expressing their fierce pleasure with a roar; and the first grasp generally disables the captive from all further resistance. With all these qualifications for slaughter, they nevertheless seem timid and cowardly, and seldom make an attack, like those of the dog kind, at a disadvantage: on the contrary, they fly when the force against them is superior, or even equal to their own; and the lion himself will not venture to make a second attempt, where he has been once repulsed with success. For this reason, in countries that are tolerably inhabited, the lion is so cowardly, that he is often scared away by the cries of women and children.

The cat, which is the smallest animal of this kind, is the only one that has been taken under human protection, and may be considered as a faithless friend, brought to oppose a still more insidious enemy.* It is, in fact, the only animal of this tribe whose services can more than recompense the trouble of their education, and whose strength is not sufficient to make its anger formidable. The lion, or the tiger, may easily be tamed, and rendered subservient to human command; but even in their humblest, and most familiar moments, they are still dangerous; since their strength is such that the smallest fit of anger or caprice may have dreadful consequences. But the cat, though easily offended, and often capricious in her resentments, is not endowed with powers sufficient to do any great mischief. Of all animals, when young, there is none more prettily playful than the kitten; but it seems to lose this disposition as it grows old, and the innate treachery of its kind is then seen to prevail. From being naturally ravenous, education teaches it to disguise its appetites, and to watch the favourable moment of plunder; supple, insinuating, and artful, it has learned the arts of concealing its intentions till it can put them into execution; when the opportunity offers, it at once seizes upon whatever it finds, flies off with it, and continues at a distance till it supposes its offence forgotten. The cat has only the appearance of attachment; and it may easily be perceived, by its timid approaches, and side-long looks, that it either dreads its master, or distrusts his kindness; different from the dog, whose caresses are sincere, the cat is assiduous rather for its own pleasure, than to please; and often gains confidence, only to abuse it. The form of its body, and its temperament, correspond with its disposition; active, cleanly, delicate, and voluptuous, it loves its ease, and seeks the softest cushions to lie on. "Many of its habits, however, are rather the consequences of its formation, than the result of any perverseness in its disposition; it is timid and mistrustful, because its body is weak, and its skin tender; a blow hurts it infinitely more than it does a dog, whose hide is thick, and body muscular; the long fur in which the cat is clothed, entirely disguises its shape, which, if seen naked, is long, feeble, and slender; it is not to be wondered, therefore, that it appears much more fearful of chastisement than the dog, and often flies, even when no correction is intended. Being also the native of the warmer climates, as will be shown hereafter, it chooses the softest bed to lie on, which is always the warmest."

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* This description is nearly translated from Mr. Buffon: what I have added is marked with inverted commas.

The cat goes with young fifty-six days, and seldom brings forth above five or six at a time. The female usually hides the place of her retreat from the male, who is often found to devour her kittens. She feeds them for some weeks with her milk, and whatever small animal she can take by surprise, accustoming them betimes to rapine. Before they are a year old, they are fit to engender; the female seeks the male with cries; nor is their copulation performed without great pain, from the narrowness of the passage in the female. They live to about the age of ten years; and during that period, they are extremely vivacious, suffering to be worried a long time before they die.

The young kittens are very playful and amusing; but their sport soon turns into malice, and they, from the beginning, show a disposition to cruelty; they often look wistfully towards the cage, sit sentinels at the mouth of a mouse-hole, and, in a short time, become more expert hunters, than if they had received the instruction of art. Indeed, their disposition is so incapable of constraint, that all instruction would be but thrown away. It is true, that we are told of the Greek monks of the isle of Cyprus, teaching cats to hunt the serpents with which the island is infested; but this may be natural to the animal itself, and they might have fallen upon such a pursuit without any instruction. Whatever animal is much weaker than themselves, is to them an indiscriminate object of destruction. Birds, young rabbits, hares, rats, and mice, bats, moles, toads, and frogs, are all equally pursued; though not, perhaps, equally acceptable. The mouse seems to be their favourite game; and, although the cat has the sense of smelling in but a mean degree, it, nevertheless, knows those holes in which its prey resides. I have seen one of them patiently watch a whole day until the mouse appeared, and continue quite motionless until it came within reach, and then seized it with a jump. Of all the marks by which the cat discovers its natural malignity, that of playing and sporting with its little captive, before killing it outright, is the most flagrant.

The fixed inclination which they discover for this peculiar manner of pursuit, arises from the conformation of their eyes. The pupil in man, and in most other animals, is capable but of a small degree of contraction and dilatation, it enlarges a little in the dark, and contracts when the light pours in upon it in too great quantities. In the eyes of cats, however, this contraction and dilatation of the pupil, is so considerable, that the pupil, which by day-light appears narrow and small like the black of one's nail, by night expands over the whole surface of the eye-ball, and, as every one must have seen, their eyes seem on fire. By this peculiar conformation, their eyes see better in darkness than light and the animal is thus better adapted for spying out and surprising its prey.

Although the cat is an inhabitant of our houses, yet it cannot properly be called a dependant; although perfectly tame, yet it acknowledges no obedience; on the contrary, it does only just what it thinks fit, and no art can control any of its inclinations. In general, it is but half tamed; and has its attachments rather to the place in which it resides, than to the inhabitant. If the inhabitant quits the house, the cat still remains; and if carried elsewhere, seems for a while bewildered with its new situation. It must take time to become acquainted with the holes and retreats in which its prey resides, with all the little labyrinths through which they often make good an escape.

The cat is particularly fearful of water, of cold, and of ill smells. It loves to keep in the sun, to get near the fire, and to rub itself against those who carry perfumes. It is excessively fond of some plants, such as valerian, marum, and cat-mint: against these it rubs, smells them at a distance, and, at last, if they be planted in a garden, wears them out.

This animal eats slowly, and with difficulty, as its teeth are rather made for tearing, than chewing its aliments. For this reason, it loves the most tender food, particularly fish, which it eats as well boiled as raw. Its sleeping is very light; and it often seems to sleep, the better to deceive its prey. When the cat walks, it treads very softly, and without the least noise; and as to the necessities of nature, it is cleanly to the last degree. Its fur also is usually sleek and glossy; and, for this reason, the hair is easily electrified, sending forth shining sparks, if rubbed in the dark.

"The wild cat breeds with the tame;* and, therefore, the latter may be considered only as a variety of the former: however, they differ in some particulars; the cat, in its savage state, is somewhat larger than the house-cat; and its fur being longer, gives it a greater appearance than it really has; its head is bigger, and face flatter; the teeth and claws much more formidable; its muscles very strong, as being formed for rapine; the tail is of a moderate length, but very thick and flat, marked with alternate bars of black and white, the end always black; the hips, and hind part of the lower joints of the leg, are always black; the fur is very soft and fine: the general colour of these animals, in England, is a yellowish white, mixed with a deep gray. These colours, though they appear at first sight confusedly blended together, yet, on a close inspection, will be found to be disposed like the streaks on the skin of the tiger, pointing from the back, downwards, rising from a black list, that runs from the head, along the middle of the back, to the tail. This animal is found in our larger woods; and is the most destructive of the carnivorous kinds in this kingdom. It inhabits the most mountainous and woody parts of these islands, living mostly in trees, and feeding only by night. It often happens, that the females of the tame kind go into the woods to seek mates among the wild ones. It should seem, that these, however, are not original inhabitants of this kingdom, but were introduced first in a domestic state, and afterwards became wild in the woods, by ill usage or neglect. Certain it is, the cat was an animal much higher in esteem among our ancestors than it is at present. By the laws of Howel, the price of a kitten, before it could see, was to be a penny; till it caught a mouse, two-pence; and when it commenced mouser, four-pence. it was required, besides, that it should be perfect in its senses of hearing and seeing, be a good mouser, have the claws whole, and be a good nurse. If it failed in any of these qualities, the seller was to forfeit to the buyer the third part of its value. If any one stole or killed the cat that guarded the prince's granary, he was to forfeit a milch ewe, its fleece and lamb, or as much wheat as when poured on the cat, suspended by the tail, (the head touching the floor,) would form a heap high enough to cover the tip of the former.—From hence we discover, besides a picture of the simplicity of the times, a strong argument that cats were not naturally bred in our forests. An animal that could have been so easily taken, could never have been rated so highly; and the precautions laid down to improve the breed, would have been superfluous, in a creature that multiplies to such an amazing degree.

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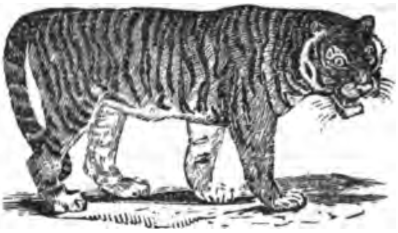
* British Zoology.

"In our climate, we know but of one variety of the wild cat: and, from the accounts of travellers, we learn, that there are but very few differences in this quadruped in all parts of the world. The greatest difference, indeed, between the wild and the tame cat, is rather to be found internally than in their outward form. Of all other quadrupeds, the wild cat is, perhaps, that whose intestines are proportionably the smallest and the shortest. The intestines of the sheep, for instance, unravelled out, and measured according to their length, will be found to be above thirty times the length of its body; whereas, the wild cat's intestines being measured out, will not be found above three times the length of its body. This is a surprising difference; but we may account for it, from the nature of the food in the two animals; the one living upon vegetables, which require a longer, and a more tedious preparation, before they can become a part of its body; the other, living upon flesh, which requires very little alteration, in order to be assimilated into the substance of the creature that feeds upon it. The one, therefore, wanted a long canal for properly digesting and straining its food; the other, but a short one, as the food is already prepared, to pass the usual secretions: however, a difficulty still remains behind; the intestines of the wild cat are, by one third, shorter than those of the tame. How can we account for this? If we say that the domestic cat, living upon more nourishing and more plentiful provision, has its intestines enlarged to the quantity with which it is supplied, we shall find this observation contradicted in the wild boar and the wolf, whose intestines are as long as those of the hog or the dog, though they lead a savage life, and, like the wild cat, are fed by precarious subsistence. The shortness, therefore, of the wild cat's intestines, is still unaccounted for; and most naturalists consider the difficulty as inextricable



Tiger, p. 113.

Lion, Lioness, and Cubs, p. 105.

To face p. 105, vol. ii.

We must leave it, therefore, as one of those difficulties which future observation or accident are most likely to discover.

This animal is one of those few which are common to the new continent, as well as the old. When Christopher Columbus first discovered that country, a hunter brought him one, which he had discovered in the woods, which was of the ordinary size, the tail very long and thick. They were common also in Peru, although they were not rendered domestic. They are well known also in several parts of Africa, and many parts of Asia. In some of these countries they are of a peculiar colour, and inclining to blue. In Persia, Pietro dello Valle informs us, that there is a kind of cat, particularly in the province of Chorazan, of the figure and form of the ordinary one, but infinitely more beautiful in the lustre and colour of its skin. It is of a gray blue, without mixture, and is soft and shining as silk. The tail is very long, and covered with hair six inches long, which the animal throws upon its back, like the squirrel. These cats are well known in France; and have been brought over into England, under the name of the *blue cat*, which, however, is not their colour.

Another variety of this animal is called by us the *lion cat;* or, as others more properly term it, the *cat of Angora.* These are larger than the common cat, and even than the wild one. Their hair is much longer, and hangs about their head and neck, giving this creature the appearance of a lion. Some of these are white, and others of a dun colour. These come from Syria and Persia, two countries which are noted for giving a long soft hair to the animals which are bred in them. The sheep, the goats, the dogs, and the rabbits of Syria, are all remarkable for the fine glossy length and softness of their hair; but particularly the cat, whose nature seems to be so inflexible, conforms to the nature of the climate and soil, loses its savage colour, which it preserves almost in every other part of the world, and assumes the most beautiful appearance. There are some other varieties in this animal, but rather in colour than in form; and in general, it may be remarked, that the cat, when carried into other countries, alters but very little, still preserving its natural manners, habits, and conformation."

THE LION.

The influence of climate upon mankind is very small;* he is found to subsist in all parts of the earth, as well under the frozen poles, as beneath the torrid zone: but in animals, the climate may be considered as congenial, and a kind of second nature. They almost all have their particular latitudes, beyond which they are unable to subsist; either perishing with a moderate cold, or dying for want of a frozen air, even in a temperate climate. The rein-deer is never seen to depart from the icy fields of the north; and, on the contrary, the lion degenerates when taken from beneath the line. The whole earth is the native country of man; but all inferior animals have each their own peculiar districts.

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* This description is principally taken from Mr. Buffon: such parts as are added from others, I have marked with inverted commas.

Most terrestrial animals are found larger, fiercer, and stronger, in the warm, than in the cold or temperate climates. They are also more courageous and enterprising; all their dispositions seeming to partake of the ardour of their native soil. The lion produced under the burning sun of Africa, is, of all others the most terrible, the most undaunted. The wolf or the dog, instead of attempting to rival him, scarce deserve to attend his motions, or become his providers. Such, however, of these animals, as are bred in a more temperate climate, or towards the tops of cold and lofty mountains, are far more gentle, or, to speak more properly, far less dangerous than those bred in the torrid valleys beneath. The lions of Mount Atlas, the tops of which are covered in eternal snows, have neither the strength nor the ferocity of the lions of Bildulgerid or Zaara, where the plains are covered with burning sands. It is particularly in these frightful deserts, that those enormous and terrible beasts are found, that seem to be the scourge and the terror of the neighbouring kingdoms. Happily, indeed, the species is not very numerous; and it seems to be diminishing daily: for those who have travelled through these countries, assure us that there are by no means so many there at present, as were known formerly; and Mr. Shaw observes, that the Romans carried fifty times as many lions from Lybia, in one year, to combat in their amphitheatres, as are to be found in the whole country at this time. The same remark is made with regard to Turkey, to Persia, and the Indies; where the lions are found to diminish in their numbers every day. Nor is it difficult to assign the cause of this diminution: it is obvious that it cannot be owing to the increase of the force of other quadrupeds, since they are all inferior to the lion, and, consequently, instead of lessening the number, only tend to increase the supplies on which they subsist; it must, therefore, be occasioned by the increase of mankind, who is the only animal in nature capable of making head against these tyrants of the forest, and preventing their increase. The arms even of a Hottentot or a Negro make them more than a match for this powerful creature; and they seldom make the attack, without coming off victorious. Their usual manner is to find out his retreat, and with spears headed with iron, to provoke him to the combat: four men are considered as sufficient for this encounter; and he against whom the lion flies, receives him upon his spear, while the others attack him behind; the lion, finding himself wounded in the rear, turns that way, and thus gives the man he first attacked an opportunity to recover. In this manner they attack him on all sides; until, at last, they entirely disable, and then dispatch him. This superiority in the numbers and the arts of man, that are sufficient to conquer the lion, serve also to enervate and discourage him; for he is brave only in proportion to the success of his former encounters. In the vast deserts of Zaara, in the burning sands that lie between Mauritania, and Negroland, in the uninhabited countries that lie to the north of Caffraria, and, in general, in all the deserts of Africa, where man has not fixed his habitation, the lions are found in great numbers, and preserve their natural courage and force. Accustomed to measure their strength with every animal they meet, the habit of conquering renders them intrepid and terrible. Having never experienced the dangerous arts and combinations of man, they have no apprehensions from his power. They boldly face him, and seem to brave the force of his arms. Wounds rather serve to provoke their rage than repress their ardour. They are not daunted even with the opposition of numbers; a single lion of the desert often attacks an entire caravan; and, after an obstinate combat, when he finds himself overpowered, instead of flying, he continues to combat, retreating, and still facing the enemy till he dies. On the contrary, the lions which inhabit the peopled countries of Morocco or India, having become acquainted with human power, and experienced man's superiority, have lost all their courage, so as to be scared away with a shout; and seldom attack any but the unresisting flocks or herds, which even women and children are sufficient to protect.

This alteration in the lion's disposition sufficiently shows that he might easily be tamed, and admit of a certain degree of education. "In fact, nothing is more common than for the keepers of the wild beasts to play with this animal, to pull out his tongue, and even to chastise him without a cause. He seems to bear it all with the utmost composure; and we very rarely have instances of his revenging these unprovoked sallies of impertinent cruelty. However, when his anger is at last excited, the consequences are terrible. Labat tells us of a gentleman who kept a lion in his chamber, and employed a servant to attend it; who, as is usual, mixed his blows with caresses. This ill-judged association continued for some time; till one morning the gentleman was awakened by a noise in his room, which, at first, he could not tell the cause of; but, drawing the curtains, he perceived a horrid spectacle; the lion growling over the man's head, which he had separated from the body, and tossing it round the floor. He immediately, therefore, flew into the next room, called to the people without, and had the animal secured from doing further mischief." However, this single account is not sufficient to weigh against the many instances we every day see of this creature's gentleness and submission. He is often bred up with other domestic animals, and is seen to play innocently and familiarly among them; and if ever it happens that his natural ferocity returns, it is seldom exerted against his benefactors. As his passions are strong, and his appetites vehement, one ought not to presume that the impressions of education will always prevail; so that it would be dangerous in such circumstances to suffer him to remain too long without food, or to persist in irritating and abusing him: however, numberless accounts assure us that his anger is noble, his courage magnanimous, and his disposition grateful. He has been often seen to despise contemptible enemies, and pardon their insults, when it was in his power to punish them. He has been seen to spare the lives of such as were thrown to be devoured by him, to live peaceably with them, to afford them a part of his subsistence, and sometimes to want food himself rather than deprive them of that life which his generosity had spared.

It may also be said that the lion is not cruel, since he is so only from necessity, and never kills more than he consumes When satiated, he is perfectly gentle; while the tiger, the wolf, and all the inferior kinds such as the fox, the pole-cat, and the ferret, kill without remorse, are fierce without cause, and by their indiscriminate slaughter, seem rather to satisfy their malignity than their hunger.

The outward form of the lion seems to speak his internal generosity. His figure is striking, his look confident and bold, his gait proud, and his voice terrible. His stature is not overgrown, like that of the elephant, or rhinoceros; nor is his shape clumsy, like that of the hippopotamos, or the ox. It is compact, well proportioned, and sizeable; a perfect model of strength joined with agility. It is muscular and bold, neither charged with fat nor unnecessary flesh. It is sufficient but to see him in order to be assured of his superior force. His large head surrounded with a dreadful mane; all those muscles that appear under the skin swelling with the slightest exertions; and the great breadth of his paws, with the thickness of his limbs, plainly evince that no other animal in the forest is capable of opposing him. He has a very broad face that, as some have imagined, resembles the human. It is surrounded with very long hair which gives it a very majestic air. The top of the head, the temples, the cheeks, the under-jaw, the neck, the breast, the shoulder, the hinder part of the legs, and the belly, are furnished with it, while all the rest of the body is covered with a very short hair of a tawny colour. "The length of the hair in many parts, and the shortness of it in others, serves a good deal to disguise this animal's real figure. The breast, for instance, appears very broad; but in reality it is as narrow and contracted in proportion as that of the generality of dogs and horses. For the same reason, the tail seems to be of an equal thickness from one end to the other, on account of the inequality of the hair with which it is encompassed; it being shorter near the insertion where the flesh and bones are large, and growing longer in proportion as its real thickness lessens towards the point, where it ends in a tuft. The hair about the neck and the breast is not different from that on the rest of the body, except in the length of it; nor is each hair pointed as in most other animals, but of an equal thickness from one end to the other. The neck is very strong, but not composed of one solid bone, as Aristotle has imagined; on the contrary, though very short and muscular, it has as many bones as the camel or the horse; for it is universal to all quadrupeds to have seven joints in the neck; and not one of them have either more or less. However, the muscles in the neck of the lion, that tie the bones together, are extremely strong, and have somewhat the appearance of bones; so that ancient authors, who have treated of this animal, have mistaken the whole for a single bone. The tongue is rough, and beset with prickles as hard as the cat's claws; these have the grain turned backwards; so that it is probable a lion, if it should attempt to lick a man's hand, as we are told it sometimes does, would tear off the skin. The eyes are always bright and fiery; nor even in death does this terrible look forsake them. In short, the structure of the paws, teeth, eyes, and tongue, are the same as in a cat; and also in the inward parts these two animals so nearly resemble each other, that the anatomist's chief distinction arises merely from the size."

The lion has, as was observed before, a large mane, which grows every year longer as the animal grows older: the lioness is without this ornament at every age. This mane is not coarse or rough as in a horse but composed of the same hair with the rest of the body lengthened and shining. The mane, as well as the rest of the body is of a yellow colour; nor is there ever any difference to be found in the colour of one lion from that of another. What the ancients might have said concerning black lions, or white, or streaked like the tiger, is not confirmed by modern experience; so that these varieties have never been seen, or exist no longer.

It is usually supposed that the lion is not possessed of the sense of smelling in such perfection as most other animals. It is also observed, that too strong a light greatly incommodes him. This is more than probable from the formation of his eyes, which, like those of the cat, seem fitted for seeing best in the dark. For this reason, he seldom appears in open day, but ravages chiefly by night; and not only the lion, but all other animals of the cat kind, are kept off by the fires which the inhabitants light to preserve their herds and flocks; the brightness of the flame dazzles their eyes, which are only fitted for seeing in the dark; and they are afraid to venture blindly into those places which they know to be filled with their enemies. "It is equally true of all this kind, that they hunt rather by the sight than the smell; and it sometimes happens that the lion pursues either the jackall or the wild dog, while they are hunting upon the scent; and, when they have run the beast down, he comes in and monopolizes the spoil. From hence, probably, may have arisen the story of the lion's provider: these little industrious animals may often, it is true, provide a feast for the lion; but they have hunted merely for themselves, and he is an unwelcome intruder upon the fruits of their toil."

The lion, when hungry, boldly attacks all animals that come in his way; but as he is very formidable, and as they all seek to avoid him, he is often obliged to hide, in order to take them by surprise.—For this purpose he crouches on his belly, in some thicket, or among the long grass, which is found in many parts of the forest; in this retreat he continues, with patient expectation, until his prey comes within a proper distance, and he then springs after it, fifteen or twenty feet from him, and often seizes it at the first bound. If he misses the effort, and in two or three reiterated springs cannot seize his prey, he continues motionless for a time, seems to be very sensible of his disappointment, and waits for a more successful opportunity. In the deserts and forests, his most usual prey are the gazelles and the monkeys, with which the torrid regions abound. The latter he takes when they happen to be upon the ground, for he cannot climb trees like the cat or the tiger, He devours a great deal at a time, and generally fills himself for two or three days to come. His teeth are so strong that he very easily breaks the bones, and swallows them with the rest of the body. It is reported that he sustains hunger a very long time, but thirst he cannot support in an equal degree; his temperament being extremely hot; some have even asserted that he is in a continual fever. He drinks as often as he meets with water, lapping it like a cat; which, as we know, drinks but slowly. He generally requires about fifteen pounds of raw flesh in a day; he prefers that of live animals, and particularly those which he has just killed. He seldom devours the bodies of animals when they begin to putrefy; and he chooses rather to hunt for a fresh spoil, than to return to that which he had half-devoured before. However, though he usually feeds upon fresh provision, his breath is very offensive, and his urine insupportable.

The roaring of the lion is so loud, that when it is heard in the night and re-echoed by the mountains, it resembles distant thunder. This roar is his natural note; for when enraged he has a different growl, which is short, broken, and reiterated. The roar is a deep hollow growl, which he sends forth five or six times a day, particularly before rain. The cry of anger is much louder and more formidable. This is always excited by opposition; and upon these occasions, when the lion summons up all his terrors for the combat, nothing can be more terrible. He then lashes his sides with his long tail, which alone is strong enough to lay a man level. He moves his mane in every direction; it seems to rise and stand like bristles round his head; the skin and muscles of his face are all in agitation; his huge eye-brows half cover his glaring eye-balls; he discovers his teeth, which are formed rather for destruction than chewing his food; he shows his tongue covered with points, and extends his claws, which appear almost as long as a man's fingers. Prepared in this manner for war, there are few animals that will venture to engage him; and even the boldest of the human kind are daunted at his approach The elephant, the rhinoceros, the tiger, and the hippopotamos, are the only animals that are not afraid singly to make opposition.

" Nevertheless, neither the leopard nor the wild boar, if provoked, will shun the combat; they do not seek the lion to attack, but will not fly at his approach; they wait his onset, which he seldom makes unless compelled by hunger; they then exert all their strength, and are sometimes successful. We are told of the combat of a lion and a wild boar, in a meadow near Algiers, which continued for a long time with incredible obstinacy. At last, both were seen to fall by the wounds they had given each other; and the ground all about them was covered with their blood. These instances, however, are very rare, for the lion is in general the undisputed master of the forest. Man is the only creature that attacks him with almost certain success; with the assistance of dogs and horses, which are trained to the pursuit. These animals that, in a state of Nature, would have fled from the presence of the lion, in an agony of consternation, when conscious of the assistance of man, become pursuers in their turn, and boldly hunt their natural tyrant. The dogs are always of the large breed; and the horses themselves, as Gesner assures us, must be of that sort called *charosn*, or lion-eyed, all others of this kind flying at the sight of the lion, and endeavouring to throw their riders. When the lion is roused, he recedes with a slow, proud motion; he never goes off directly forward, nor measures his paces equally, but takes an oblique course, going from one side to the other, and bounding rather than running.— When the hunters approach him, they either shoot or throw their javelins and in this manner disable him before he is attacked by the dogs, many of whom he would otherwise destroy. He is very vivacious, and is never killed at once, but continues to fight desperately even after he has received his mortal blow. He is also taken by pit falls; the natives digging a deep hole in the ground, and covering it slightly over with sticks and earth; which, however, give way beneath his weight, and he sinks to the bottom, from whence he has no means of escape. But the most usual manner of taking this animal is while a cub, and incapable of resistance. The place near the den of the lioness is generally well known by the greatness of her depredations on that occasion; the natives, therefore, watch the time of her absence, and, aided by a swift horse, carry off her cubs; which they sell to strangers, or to the great men of their country."

The lion, while young and active, lives by hunting in the forest at the greatest distance from any human habitation; and seldom quits this retreat while able to subsist by his natural industry; but when he becomes old and unfit for the purposes of surprise, he boldly comes down into places more frequented, attacks the flocks and herds that take shelter near the habitation of the shepherd or the husbandman, and depends rather upon his courage than his address for support. It is remarkable, however, when he makes one of these desperate sallies, if he finds men and quadrupeds in the same field, he only attacks the latter, and never meddles with men, unless they provoke him to engage. It is observed that he prefers the flesh of camels to any other food; he is likewise said to be fond of that of young elephants; these he often attacks before their trunk is yet grown; and, unless the old elephant comes to their assistance, he makes them an easy prey.

The lion is terrible upon all occasions, but particularly at those seasons when he is incited by desire, or when the female has brought forth. It is then that the lioness is seen followed by eight or ten males, who fight most bloody battles among each other, till one of them become victorious over all the rest. She is said to bring forth in spring, and to produce but once a year. "With respect to the time of gestation, naturalists have been divided, some asserting that the lioness went with young six months, and others but two. The time also of their growth and their age have hitherto been left in obscurity; some asserting that they acquired their full growth in three years, and others that they required a longer period to come to perfection; some saying (and among this number is Mr. Buffon) that they lived to but twenty, or twenty-two years at most; others making their lives even of shorter duration. All these doubts are now reduced to certainty; for we have had several of these animals bred in the Tower; so that the manner of their copulation, the time of their gestation, the number they bring forth, and the time they take to come to perfection, are well known. Although the lion emits his urine backwards, yet he couples in the ordinary manner; and, as was said before, his internal structure in almost every respect resembles that of a cat. The lioness, however, is upon these occasions particularly fierce, and often wounds the lion in a terrible manner. She goes with young, as I am assured by her keeper, no more than five months; the young ones, which are never more than two in number when brought forth are about the size of a large pug-dog, harmless, pretty, and playful they continue the teat for twelve months, and the animal is more than five years in coming to perfection. As to its age, from its imprisoned state, we can have no certainty; since it is very probable, that, being deprived of its natural climate, food, and exercise, its life must be very much abridged. However, naturalists have hitherto been greatly mistaken as to the length of its existence. The great he-lion, called *Pompey*, which died in the year 1760, was known to have been in the Tower for above seventy years; and one lately died there, which was brought from the river Gambia, that died above sixty-three. The lion, therefore, is a very long-lived animal; and, very probably, in his native forest, his age exceeds even that of man himself."

In this animal, all the passions, even of the most gentle kind, are in excess, but particularly the attachment of the female to her young. The lioness, though naturally less strong, less courageous, and less mischievous than the lion, becomes terrible when she has got young ones to provide for. She then makes her incursions with even more intrepidity than the lion himself; she throws herself indiscriminately among men and other animals; destroys without distinction; loads herself with the spoil, and brings it home reeking to her cubs, whom she accustoms betimes to cruelty and slaughter. She usually brings forth in the most retired and inaccessible places; and when she fears to have her retreat discovered, often hides her tracks, by running back her ground, or by brushing them out with her tail. She sometimes also, when her apprehensions are great, transports them from one place to another; and, if obstructed, defends them with determined courage, and fights to the last.

The lion is chiefly an inhabitant of the torrid zone; and, as was said, is always most formidable there: nevertheless, he can subsist in more temperate climates; and there was a time when even the southern parts of Europe were infested by him. At present, he is only found in Africa and the East-Indies; in some of which countries he grows to an enormous height. The lion of Bildulgerid is said to be nearly five feet high, and between nine and ten feet from the tip of the nose to the insertion of the tail. We have in the Tower, at present, one of above four feet high that was brought from Morocco, which was the largest that for some time past has been seen in Europe. The ordinary size is between three and four feet; the female being in all her dimensions about one-third less than the male. There are no lions in America; the Puma, which has received the name of the *American lion*, is, when compared, a very contemptible animal, having neither the shape, the size, nor the mane of the lion; being known to be extremely cowardly, to climb trees for its prey, to subsist rather by its cunning than its courage, and to be inferior even to the animal that goes by the name of the *American tiger*. We ought not, therefore, to confound this little treacherous creature with the lion, which all the ancients have concurred in denominating the *king of beasts*, and which they have described as brave and merciful. "Indeed, the numerous accounts which they have given us of this animal's generosity and tenderness, show that there must be some foundation for the general belief of its good qualities; for mankind seldom err when they are all found to unite in the same story. However, perhaps, the caution of Aristophanes, the comic poet, is better followed in practice, who advises us to have nothing to do with this creature, but to let the lioness suckle her own whelps.

THE TIGER

"The ancients had a saying, *That as the peacock is the most beautiful among birds, so is the tiger among quadrupeds.*[*] In fact, no quadruped can be more beautiful than this animal; the glossy smoothness of his hair, which lies much smoother, and shines with greater brightness than even that of the leopard; the extreme blackness of the streaks with which he is marked, and the bright yellow colour of the ground which they diversify, at once strike the beholder. To this beauty of colouring is added an extremely elegant form, much larger, indeed, than that of the leopard, but more slender, more delicate, and bespeaking the most extreme swiftness and agility. Unhappily, however, this animal's disposition is as mischievous as its form is admirable, as if Providence was willing to show the small value of beauty, by bestowing it on the most noxious of quadrupeds. We have at present one of these animals in the Tower, which to the view appears the most good-natured and harmless creature in the world; its physiognomy is far from fierce or angry; it has not the commanding, stern countenance of the lion, but a gentle, placid air; yet, for all this, it is fierce and savage beyond measure; neither correction can terrify it, nor indulgence can tame.

The chief and most observable distinction in the tiger, and in which it differs from all others of the mottled kind, is in the shape of its colours, which run in streaks or bands in the same direction as his ribs, from the back down to the belly. The leopard, the panther, and the ounce, are all partly covered like this animal, but with this difference, that their colours are broken in spots all over the body; whereas, in the tiger they stretch lengthwise, and there is scarce a round spot to be found on his skin. Besides this, there are other observable distinctions: The tiger is much larger, and often found bigger than even the lion himself; it is much slenderer also in proportion to its size; its legs shorter, and its neck and body longer. In short, of all other animals, it most resembles the cat in shape; and, if we conceive the latter magnified to a very great degree, we shall have a tolerable idea of the former.

In classing carnivorous animals, we may place the lion foremost;[†] and immediately after him follows the tiger, which seems to partake of all the noxious qualities of the lion, without sharing any of his good ones. To pride, courage, and strength, the lion joins greatness, clemency, and generosity: but the tiger is fierce without provocation, and cruel without necessity. The lion seldom ravages except when excited by hunger; the tiger, on the contrary, though glutted with slaugh er. is not satisfied, still continues the carnage, and seems to have its courage only inflamed by not finding resistance. In falling in among a flock or herd, it gives no quarter, but levels all with indiscriminate cruelty, and scarce finds time to appease its appetite while intent upon satisfying the malignity of its nature. It thus becomes the scourge of the country where it is found ; it fears neither the threats nor the opposition of mankind ; the beasts, both wild and tame, fall equally a sacrifice to its insatiable fury ; the young elephant and the rhinoceros becomes equally its prey, and it not unfrequently ventures to attack even the lion himself.

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[*] Tantem autem præstat pulchritudine tigris inter alias feras quantum inter volucres pavo.

[†] The remainder of this description is taken from Mr. Buffon, except where marked with commas.

Happily for the rest of Nature, that this animal is not common, and that the species is chiefly confined to the warmest provinces of the East. The tiger is found in Malabar, in Siam, in Bengal, and in all the countries which are inhabited by the elephant or the Rhinoceros. Some even pretend that it has a friendship for, and often accompanies the latter, in order to devour its excrements, which serve it as a purge. Be this as it will, there is no doubt but that they are often seen together at the sides of lakes and rivers ; where they are probably both compelled to go by the thirst which, in that torrid climate, they must very often endure. It is likely enough also that they seldom make war upon each other, the rhinoceros being a peaceable animal, and the tiger knowing its strength too well to venture the engagement.—It is still more likely that the tiger finds this a very convenient situation, since it can there surprise a greater number of animals which are compelled thither from the same motives. In fact, it is generally known to lurk near such places where it has an opportunity of choosing its prey or rather of multiplying its massacres. When it has killed one, it often goes to destroy others, swallowing their blood down at large draughts, and seeming rather glutted than satiated with its abundance.

However, when it has killed a large animal, such as a horse or a buffalo, it immediately begins to devour it on the spot, fearing to be disturbed. In order to feast at his ease, it carries off its prey to the forest, dragging it along with such ease, that the swiftness of its motion seems scarce retarded by the enormous load it sustains. From this alone, we may judge of its strength ; but to have a more just idea of this particular, let us stop a moment to consider the dimensions of this most formidable creature. Some travellers have compared it for size to a horse, and others to a buffalo, while others have contented themselves with saying, that it is much larger than a lion. We have recent accounts of this animal's magnitude that deserve the utmost confidence. Mr. Buffon has been assured by one of his friends, that he saw a tiger in the East-Indies fifteen feet long. " Supposing that he means including the tail, this animal, allowing four feet for that, must have been eleven feet from the tip of the nose to the insertion of the tail. Indeed, that which is now in the Tower is not so large, being as well as I could measure, six feet from the tip to the insertion, and the tail was three feet more. Like all the rest of its kind its motions are irregular and desultory ; it bounds rather than runs ; and, like them, rather chooses to take its prey by surprise, than to be at the trouble of hunting it down." How large a leap it can take at once we may easily judge, by comparing what it might do, to what we see so small an animal as the cat actually perform. The cat can leap several feet at a bound; and the tiger, who is ten times as long, can no doubt spring proportionably.

"The tiger is the only animal whose spirit seems untameable.—Nether force nor constraint, neither violence nor flattery, can prevail in the least on its stubborn nature. The caresses of the keeper have no influence on their heart of iron; and time, instead of mollifying its disposition, only serves to increase its fierceness and malignity. The tiger snaps at the hand that feeds it, as well as that by which it is chastised; every object seems considered only as its proper prey, which it devours with a look; and, although confined by bars and chains, still makes fruitless efforts, as if to show its malignity, when incapable of exerting its force."

To give a still more complete idea of the strength of this terrible creature, we shall quote a passage from father Tachard, who was an eye-witness of a combat between a tiger and three elephants at Siam. For this purpose the king ordered a lofty pallisade to be built of bamboo cane, about a hundred feet square; and in the midst of this were three elephants appointed for combating the tiger. Their heads, and a part of their trunk were covered with a kind of armour, like a mask, which defended that part from the assaults of the fierce animal with which they were to engage. As soon, says this author, as they were arrived at the place, a tiger was brought forth from his den, of a size much larger than we had ever seen before. It was not at first let loose, but held with cords, so that one of the elephants approaching, gave it three or four terrible blows, with its trunk on the back, with such force, that the tiger was for some time stunned, and lay without motion, as if it had been dead. However, as soon as it was let loose, and at full liberty, although the first blows had greatly abated its fury, it made at the elephant with a loud shriek, and aimed at seizing his trunk. But the elephant, wrinkling it up with great dexterity, received the tiger on his great teeth and tossed it up into the air. This so discouraged the furious animal, that it no more ventured to approach the elephant, but made several circuits round the pallisade, often attempting to fly at the spectators. Shortly after, three elephants were sent against it, and they continued to strike it so terribly with their trunks, that it once more lay for dead; and they would certainly have killed it, had not there been a stop put to the combat.

From this account, we may readily judge of the strength of this animal, which, although reduced to captivity, and held by cords; though first disabled, and set alone against three, yet ventured to continue the engagement, and even that against animals covered and protected from its fury.

"Captain Hamilton informs us, that in the Sundah Rajah's dominions there are three sorts of tigers in the woods, and that the smallest are the fiercest. This is not above two feet high, appears to be extremely cunning, and delights in human flesh. The second kind is about three feet high, and hunts deer and wild hogs, besides the little animal which has been already described under the name of the *chevrotin*, or *Guinea deer*. The tiger of the largest sort is above three feet and a half high: but, although endowed with greater powers, is, by no means, so rapacious as either of the former. This formidable animal, which is called the *royal tiger* (one of which we have at present in the Tower,) does not seem so ravenous nor so dangerous, and is even more cowardly. A peasant in that country, as this traveller informs us, had a buffalo fallen into a quagmire, and while he went for assistance, there came a large tiger, that with its single strength drew forth the animal, which the united force of many men could not effect. When the people returned to the place, the first object they beheld was the tiger who had thrown the buffalo over its shoulder, as a fox does a goose, and was carrying it away, with the feet upwards, towards its den; however, as soon as it saw the men, it let fall its prey, and instantly fled to the woods: but it had previously killed the buffalo, and sucked its blood; and, no doubt, the people were very well satisfied with its retreat.—It may be observed that some East Indian buffaloes weigh above a thousand pounds, which is twice as heavy as the ordinary run of our black cattle; so that from hence we may form a conception of the enormous strength of this rapacious animal, that could thus run off with a weight at least twice as great as that of itself.

"Were this animal as common as the panther, or even as the lion himself, thus furnished as it is with the power to destroy, and the appetite for slaughter, the country would be uninhabitable where it resides. But luckily the species is extremely scarce; and has been so since the earliest accounts we have had of the tiger. About the times of Augustus, we are assured by Pliny,* that when panthers were brought to Rome by hundreds, a single tiger was considered as an extraordinary sight; and he tells us, that the emperor Claudius was able to procure four only; which shows how difficultly they were procured. The incredible fierceness of this animal may be, in some measure, the cause of the scarcity which was then in Rome, since it was the opinion of Varro, that the tiger was never taken alive;† but its being a native only of the East-Indies, and that particularly of the warmer regions, it is not to be wondered that the species should be so few."

We may, therefore, consider the species of the true streaked tiger, as one of the scarcest of animals, and much less diffused than that of the lion. As to the number of its young, we have no certain accounts; however, it is said, that it brings forth four or five at a time. Although furious at all times, the female, upon this occasion, exceeds her usual rapacity; and, if her young are taken from her, she pursues the spoiler with incredible rage; he, to save a part, is contented to lose a part, and drops one of her cubs, with which she immediately returns to her den, and again pursues him; he then drops another, and by the time she has returned with that, he generally escapes with the remainder. If she loses her young entirely, she then becomes desperate, boldly approaches even the towns themselves, and commits incredible slaughter. The tiger expresses its resentment in the same manner with the lion; it moves the muscles and skin of its face, shows its teeth, and shrieks in the most frightful manner. Its note is very different from that of the lion; being rather a scream than a roar;

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* Plin. Hist. Nat. lib. viii. c. 17.

† Tigris vivus capi ad huc non potuit. Var de ling. Lat.

and the ancients expressed it very well, when they said that, *tigrides indomitæ raucant rugiuntque leones.*

The skin of these animals is much esteemed all over the east, particularly in China; the Mandarines cover their seats of justice in the public places with it, and convert it into coverings for cushions in winter. In Europe, these skins, though but seldom to be met with, are of no great value, those of the panther and the leopard being held in much greater estimation. This is all the little benefit we derive from this dreadful animal, of which so many falsehoods have been reported; as, that its sweat was poisonous, and the hair of its whiskers more dangerous than an envenomed arrow. But the real mischiefs which the tiger occasions while living are sufficient, without giving imaginary ones to the parts of its body when dead. In fact, the Indians sometimes eat its flesh, and find it neither disagreeable nor unwholesome.

There is an animal of America, which is usually called the *red tiger*, but Mr. Buffon calls it the *cougar*, which, no doubt, is very different from the tiger of the east. Some, however, have thought proper to rank both together, and I will take leave to follow their example, merely because the cougar is more like a tiger in every thing, except the colour, than any other animal I know, having the head, the body, and the neck, shaped very much in the same manner. Of these slight differences, words would give but a very faint idea; it will be therefore, sufficient to observe, that they are both equally slender, and are smaller where the neck joins the head, than others of the panther kind. There is one at present in the tower; and it seemed to me, as well as I could see it through the bars, that were it properly streaked and coloured, it would in all things resemble a small tiger. It is, however, of a very different colour, being of a deep brown, and the tail very long and pointed. It is rather darker on the back; under the chin it is a little whitish, as also on the lower part of the belly.

Of all the American animals, this is the most formidable and mischievous; even their pretended lion not excepted: It is said there are several sorts of them; and, as well as I can remember, I have seen one or two here in England, both differing from the present, in size and conformation. It is, indeed, a vain endeavour to attempt to describe all the less obvious varieties in the cat kind. If we examine them minutely, we shall find the differences multiply upon us so much, that instead of a history, we shall only be paid with a catalogue of distinctions. From such of them as I have seen, within these last six years, I think I could add two animals of this species, that have not been hitherto described, and with the names of which, he that showed them was utterly unacquainted. But it is a poor ambition, that of being eager to find out new distinctions, or adding one noxious animal more, to a list that is already sufficiently numerous. Were the knowing a new variety to open an unknown history, or in the least to extend our knowledge, the inquiry would be then worth pursuing, but what signifies mentioning some trifling difference, and from thence becoming authors of a new name, when the difference might have originally proceeded either from climate, soil, or indiscriminate copulation?

The cougars are extremely common in South America; and, where the towns border upon the forest, these make frequent incursions by night into the midst of the streets, carrying off fowls, dogs, and other domestic creatures. They are, however, but weak and contemptible, compared to the great tiger, being found unable to cope with a single man. The Negroes and Indians are very dextrous in encountering them; and some, even for the sake of their skins, seek them in their retreats. The arms in this combat, seemingly so dangerous, are only a lance of two or three yards long, made of heavy wood, with the point hardened in the fire; and a kind of scymitar, of about three quarters of a yard in length. Thus armed, they wait till the tiger makes an assault against the left hand which holds the lance, and is wrapped up in a short cloak of baize. Sometimes the animal, aware of the danger, seems to decline the combat; but then its antagonist provokes it with a slight touch of the lance, in order, while he is defending himself, to strike a sure blow. As soon, therefore, as the creature feels the lance, it grasps it with one of its paws, and with the other strikes at the arm which holds it. Then it is that the person nimbly aims a blow with his scymitar, which he kept concealed, with the other hand, and hamstrings the creature, which immediately draws back enraged, but instantly returns to the charge. But then, receiving another stroke, it is totally deprived of the power of motion: and the combatant, killing it at his leisure, strips the skin, cuts off the head, and returns to his companions, displaying these as the trophies of his victory.

This animal, as we are assured, is often more successful against the crocodile; and it is the only quadruped in that part of the world, that is not afraid of the engagement. It must be no unpleasant sight to observe, from a place of safety, this extraordinary combat, between animals so terrible and noxious to man. Such as have seen it, describe it in the following manner. When the tiger impelled by thirst, that seems continually to consume it, comes down to the river side to drink, the crocodile, which makes no distinction in its prey, lifts its head above water to seize it; the tiger, not less rapacious than the other, and unacquainted with the force of the enemy, boldly ventures to seize it, and plunges its claws into the eyes of the crocodile, which are the only vulnerable parts of its body: upon this the crocodile instantly dives under water, and the tiger goes down with him, for he will sooner die than let go his hold. In this manner the combat continues for some time, until the tiger is drowned, or escapes, as is sometimes the case, from its disabled enemy.

These animals are common in Guiana.* They were formerly seen swimming over, in great numbers, into the island of Cayenne, to attack and ravage the flocks and herds of the inhabitants. In the beginning, they were a terrible scourge to the infant colony; but, by degrees, they were repulsed and destroyed, and are now seen no longer at that place. They are found in Brazil, in Paraguay, in the country of the Amazons, and in several other parts of South America. They often climb trees in quest of prey, or to avoid their pursuers. They are

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* Buffon, vol. xix. p. 22

Crossbill, p. 142.

Cuckoo, p. 123

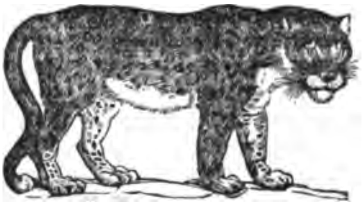
Jay, p. 115.

Starling, p. 141.

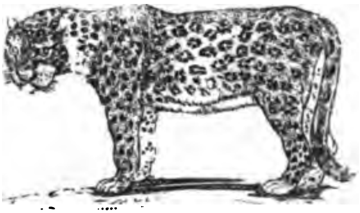
Roller, p. 116.

Woodpecker, p. 118.

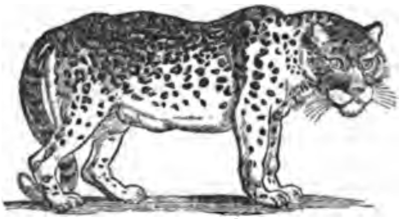
To face p 118, vol. ii.



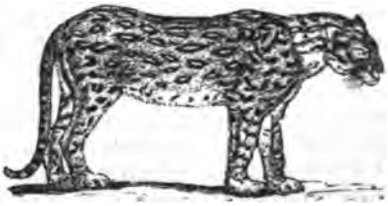
Panther, p. 119.



Leopard, p. 119.



Ounce, p. 121.



Jaguar, p. 120.

To face p. 119, vol. ii.

deterred by fire, like all other animals of the cat kind; or more properly speaking, they seldom venture near those places where they see it kindled, as they are always sure of their enemies being near, and their nocturnal eyes are dazzled by the brightness of the blaze. From the description of this animal, one would be hardly led to suppose, that its flesh was good for food; and yet we have several accounts which allege the fact, some asserting it to be superior even to mutton: however, what Monsieur Des Marchais observes, is most likely to be true; namely, that the most valuable part of this animal is its skin, and that its flesh is but indifferent eating, being generally lean, and usually having a strong fume.

THE PANTHER AND THE LEOPARD.

We have hitherto found no great difficulty in distinguishing one animal from another, each carrying its own peculiar marks, which, in some measure, serve to separate it from all the rest. But it is otherwise, when we come to those of the cat kind, that fill up the chasm between the tiger and the cat. The spots with which their skins are diversified, are so various and their size so equivocal, that it is no easy matter to distinguish the species, particularly as we have little else but the spots and the size to guide us in making the distinction. If we regard the figure and diversity of the spots, we shall find many varieties not taken notice of by any naturalist: if we are led by the size, we shall find an imperceptible gradation from the cat to the tiger. It would be vain, therefore, to make as many varieties in these animals as we see differences in spots or stature; it will be sufficient to seize the most general distinctions, and leave the rest to such as are fond of more minute disquisitions.

Of all this tribe, whose skins are so beautifully spotted, and whose natures are so mischievous, the panther may be considered as the foremost. This animal has been by many natrualists mistaken for the tiger; and in fact, it approaches next to it in size, fierceness, and beauty. It is distinguished, however, by one obvious and leading character; that of being spotted, not streaked; for, in this particular, the tiger differs from the panther, the leopard, and almost all the inferior ranks of this mischievous family.

This animal, which Mr. Buffon calls simply the *panther*, Linnæus, the *pard*, Gesner the *pardalis*, and the modern Latins the *leopardus*; this animal, I say, which goes by too many names, and which the English have indiscriminately called by the name of the PANTHER or the LEOPARD, may be considered as the largest of the kind, and is spotted in a manner somewhat different from those that are smaller.—As those spots, however, make the principal difference between it and the lesser animals, which it otherwise resembles in shape, size, disposition, and beauty, I will first show these slight distinctions, and mention the names each animal has received in consequence thereof; and then proceed to give their history together, still marking any peculiarity observable in one of the species, which is not found in the rest

Next to the great panther, already mentioned, is the animal which Mr Buffon calls the LEOPARD, a name which he acknowledges to be given arbitrarily, for the sake of distinction. Other naturalists have not much attended to the slight differences between this and the great panther, nor have they considered its discriminations as sufficient to entitle it to another name. It has hitherto, therefore, gone under the name of the LEOPARD, or PANTHER of Senegal, where it is chiefly found. The differences between this animal and the former are these: the large panther is often found to be six feet long, from the tip of the nose to the insertion of the tail; the panther of Senegal is not above four. The large panther is marked with spots in the manner of a rose, that is, five or six make a kind of circle, and there is generally a large one in the middle. The leopard of Senegal has a much more beautiful coat, the yellow is more brilliant, and the spots are smaller and not disposed in rings, but in clusters. As to the rest, they are both whitish under the belly; the tail in both is pretty long, but rather longer in proportion in the latter, than in the former. To these two animals, whose differences seem to be so very minute, we may add a third; namely, the JAGUAR, or PANTHER of America. This, in every respect, resembles the two former, except in the disposition of its spots, and that its neck and head are rather streaked than spotted. The jaguar is also said to be lower upon its legs, and less than the leopard of Senegal. These three quadrupeds, as we see have but very slight differences, and the principal distinction used by Mr. Buffon, is taken from the size; the first, as he says, is usually six feet long; the second, four feet; and the last, about three: however it appears from the particular subjects of his description, that the panther in his possession was not above three feet seven inches long; that the leopard's skin which he describes, was about four; and that the jaguar, at two years old, was between two and three feet long, which, when come to its full growth, would, no doubt, be four feet long, as well as the two former. From hence, therefore, we may conclude, that the size in these animals is not sufficient to make a distinction among them; and that those who called them all three by the indiscriminate names of the leopard and the panther, if not right, were at least excusable. Of those which are now to be seen in the Tower, the jaguar, or the American panther, is rather the largest of the three; and is by no means the contemptible animal which Mr. Buffon describes it to be: the leopard is the least of them, and has by some travellers, been supposed to be an animal produced between the panther and the ounce, an animal which resembles, but is less than any of the former. These three animals we may, therefore, rank together, as they agree pretty nearly in their robe, their size, their dispositions, and their ferocity.

We come next to an animal confessedly different from any of the former, being much smaller, and its colour more inclining to white. Its name, however, in our language, has caused no small confusion. It has been generally called by foreigners, the ONZA, or the OUNCE and this name some of our own writers have thought proper to give it; but others of them, and these the most celebrated, such as Willoughby have given this name to a different animal, with a short tail, and known

Lynx, p. 121.

Cougar, p. 117.

Hyena, p. 153.

Opossum, p. 210.

To face p. 120, vol. ii.

to the ancients and moderns by the name of the *lynx*. I confess myself at a loss, in this case, whom to follow; the alteration of names should be always made with great caution, and never but in cases of necessity. If we follow Willoughby, there will be an animal of the panther kind, very distinguishable from all the rest, left without a name; and if we recede from him, it will serve to produce some confusion among all the numerous class of readers and writers who have taken him for their guide: however, as he seems himself to have been an innovator, the name of the lynx having been long adopted into our language before, it was unnecessary to give the animal that bore it another name, and to call that creature an ounce, which our old writers had been accustomed to know by the Latin appellation; for this reason, therefore, we may safely venture to take a name that has been long misapplied, from the lynx, and restore it to the animal in question. We will, therefore, call that animal of the panther kind, which is less than the panther, and with a longer tail, the *ounce;* and the lynx may remain in possession of that name by which it was known among all our old English writers, as well as by all antiquity.

The OUNCE, or the ONZA of Linnæus, is much less than the panther, being not, at most, above three feet and a half long: however, its hair is much longer than that of the panther, and its tail still more so. The panther of four or five feet long, has a tail but of two feet, or two feet and a half. The ounce, which is but about three feet, has a tail often longer than the rest of its body. The colour of the ounce is also apparently different, being rather more inclining to a cream-colour, which is deeper on the back, and whiter towards the belly. The hair on the back is an inch and a half long; and that on the belly two inches and a half, which is much longer than that of the panther. Its spots are disposed pretty much in the same manner as the large panther, except that on the haunches it is rather marked with stripes than with spots.

Descending to animals of this kind that are still smaller, we find the CATAMOUNTAIN, which is the ocelot of Mr. Buffon, or the tiger-cat of most of those who exhibit as a show. It is less than the ounce, but its robe more beautifully variegated. It is an American animal, and is about two feet and a half in length, from the nose to the insertion of the tail. It is extremely like a cat, except that it is larger and slenderer, that its colours are more beautiful, and its tail rather shorter. The fur is of a reddish colour, the whole beautified with black spots, and streaks of different figures. They are long on the back, and round on the belly and paws. On the ears are black stripes, which run across; but, in other respects, they entirely resemble those of a cat.—These colours, however, which naturalists have taken great pains minutely to describe, are by no means permanent, being differently disposed in different animals of the same species. I remember to have seen an animal of this size, but whether of this species I will not pretend to say, some years ago, that was entirely brown, and was said also to have come from America.

From this tribe of the cat kind, with spotted skins and a long tail, we come to another, with skins diversified in like manner, but with a shorter tail. The principal of these is the LYNX, the name by which the animal was known to Ælian, among the ancients; and to all our old English writers among those of a more modern date. This name has been corrupted by the Portuguese into the word *onze*; and this corruption has been adopted by Ray, who has improperly called this animal the *ounce*, after some of the foreign travellers. The first striking distinction between the lynx, and all those of the panther kind, is in its tail, which is at least half as short in proportion, and black at the extremity. Its fur is much longer, the spots on the skin less vivid, and but confusedly mingled with the rest. Its ears are much longer, and tipped at the point with a black tuft of hair. The colour round the eyes is white, and the physiognomy more placid and gentle. Each hair of this animal is of three different colours: the root is of a greyish brown; the middle red, or of an ash-colour; and the ends white.—This whiteness at the ends takes up so small a part of the particular hair, that it does not prevent us from seeing the principal colour, which is that in the middle part; so that it only makes the surface of the body appear as if it were silvered over: however, the hair of which the spots consist has no white at the ends, and at the roots it is not quite so black as the other part. This animal is not above the size of the ounce, but is rather stronger built, and it has but twenty-eight teeth; where as all the rest of the cat kind already mentioned have thirty.

Another animal of this kind is called the SIAGUSH, or, as Mr. Buffon names it, the CARACAL. It is a native of the East Indies, and resembles the lynx in size, in form, and even in the singularity of being tuffed at the tips of the ears. However, the siagush differs in not being mottled as the lynx is; its fur, or rather hair, is rougher and shorter; its tail is rather longer, its muzzle more lengthened; its physiognomy more fierce, and its nature more savage.

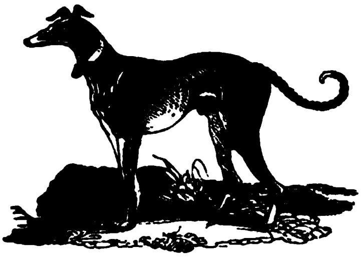
The third and last animal that needs to be mentioned of this kind, is that which Mr. Buffon calls the SERVAL, and which he has first described. It is a native of Malabar, resembling the panther in its spots, but the lynx in the shortness of its tail, in its size, and in its strong built form.

These seem to be all the principal distinctions among animals of the panther kind, from the largest of this tribe down to the domestic cat, which is the smallest of all these fierce, and mischievous varieties. In all, their nature seems pretty much the same; being equally fierce, subtle, cruel, and cowardly. The panther, including the leopard and the jaguar, or American panther, as they are the largest, so also are they the most dangerous, of this kind; for the whole race of cats are noxious in proportion to their power to do mischief. They inhabit the most torrid latitudes of India, Africa, and America, and have never been able to multiply beyond the torrid zone. They are generally found in the thickest and the most entangled forests, and often near remote habitations, where they watch to surprise all kinds of domestic animals. They very seldom attack man, even though provoked by him; they rather seem desirous of finding safety by flight, or by climbing trees, at which they are very expert. In this manner, also, they often pursue their prey, and being expert at seizing it, as well above as below, they cause a vast destruction. Of all other animals

Domestic Cat, p. 100

Bull Dog, p. 134.

Shepherd's Dog, p. 131.



Greyhound, p. 133.

To face p. 123, vol. ii.

these are the most sullen, and, even to a proverb, untameable.—They still preserve their fierce and treacherous spirit; and at those places where they are exposed to be seen among others, we often observe that while their keeper is familiar with the lion or the bear, yet he is apprehensive of the large panther, and keeps it bound with the shortest chain.

As the ounce differs from these in figure and size, so also it seems to differ in disposition, being more mild, tractable, and tame. These we often see as harmless and innocent as cats; and there is one at present in the Tower with which the keeper plays without the smallest apprehension.—I own I was not a little uneasy, at first, for the man, when he put his hand through the bars, and called the animal by its name; but I was a good deal surprised to see the creature, which one might suppose irritated by long confinement, come gently up to him, stroke his hand with its face, in the manner of a cat, and testify the utmost gentleness of disposition. The ounce, therefore, is remarkable for being easily tamed; and, in fact, it is employed all over the East for the purposes of hunting. Not, indeed, but the panthers themselves are sometimes used for this purpose, but they are never thoroughly subdued like the former, being usually brought to the field in a carriage, and kept chained and caged until they are shown the gazelle, or the leveret, which is their prey. This they pursue rather by three or four great springs than by running. If they seize it by this sudden effort, it finds no mercy; but if it escapes from this first effort, they never attempt to pursue, and appear quite disappointed and confounded at their mischance. It sometimes happens that they are so much enraged at it, that they attack even their employer, and his only resource to avoid their fury is to throw them some small pieces of meat, which he has brought with him for that purpose.

The ounce, however, is not so dangerous; and is treated with more confidence and familiarity. It is usually brought to the field hoodwinked behind one of the horsemen. When the game appears, the ounce is instantly uncovered, and shown where it lies; upon which the fierce creature darts like an arrow to the place, and seizes it at once, or, missing it, remains motionless on the place. It would be vain to attempt retrieving its disgrace, by continuing the pursuit; for although it bounds with greater agility than most other animals, yet i is slow and awkward in running, and has no means of finding the animal it pursues by the smell, as is common among those of the dog kind. From hence, therefore, it appears how much superior the European method of hunting is to that of the Asiatic; since whatever amusement this exercise affords must arise from the continuance of the chase, and from the fluctuation of doubt and expectation, which raise and depress the pursuers by turns. All this an Asiatic hunter is deprived of; and his greatest pleasure can scarcely be more than what among us is called *coursing*, in which the dog pursues the animal, and keeps it constantly in view.

But it must not be supposed that it is from choice the Asiatics use this method of chase; for, no doubt, werewere serviceable among them as they are in Europe, they would be employed for the same purposes But the fact is, that the extreme heat of the tropical climates producsuch universal putrefaction, and sends up such various and powerful scents, that dogs are at first bewildered in the chase, and at last come to lose the delicacy of their scent entirely. They are, therefore, but little used in those warm countries; and what could they avail in places where almost every other animal of the forest is stronger and more rapacious? The lion, the tiger, the panther, and the ounce, are all natural enemies to the dog, and attack him wherever he appears with ungovernable fury. The breed, therefore, in those places would quickly be destroyed; so that they are obliged to have recourse to those animals which are more fitted to serve them; and thus convert the ounce to those purposes for which dogs are employed in Europe.

The CATAMOUNTAIN, or OCELOT, is one of the fiercest, and for its size, one of the most destructive animals in the world. It is, as was before observed, a native of South America, and by no means capable of the same education as the ounce, which it more approaches in size than in disposition. Two of these, from whom Mr. Buffon has taken his description, were brought over from Carthagena, and having been taken from the dam when very young were afterwards suckled by a bitch. But, before they were three months old, they had strength and ingratitude enough to kill and devour their nurse. Their succeeding fierceness and malignity seemed to correspond with their first efforts; for no arts could tame or soften their natures; and while they continued in their cages, they still testified an unceasing disposition for slaughter. When their food was given them, the male always served himself before the female would venture to touch a bit; and it was not till he was satisfied that the other began. In their savage state, these animals are still more destructive; having great strength and agility, they very easily find and overtake their prey, which they pursue among the tops of the trees, as well as on the ground; but what renders them still more mischievous is, their unceasing appetite rather for the blood than the flesh of their prey. They suck this with the greatest avidity, but frequently leave the carcase otherwise untouched, in order to pursue other animals for the blood in like manner. They generally continue on the tops of trees, like our wild cats, where they make their nest, and often bring forth their young. When they spy any animal they can master, and there are but few in the forest but what are inferior, they dart down upon it with inevitable exactness.

The whole tribe of animals of the panther kind, with long tails, are chiefly inhabitants, as was said, of the the torrid zone; but those of the short-tailed kind, and particularly the lynx, is principally found in the cold countries that are bordering on the pole. The lynx is chiefly to be met with in the north of Germany, Lithuania, Muscovy, Siberia, and North America. Those of the new continent, however, are rather smaller, than in Europe, as is the case with almost all their quadrupeds; they are somewhat whiter also, but in other respects there is scarce any difference to be found among them.* This animal has been called by some *lupus cervarius*, or a creature compounded between a wolf and a stag; but for what reason is hard to guess; it no way re sembles either in shape or in disposition. In its nature, it exactly resembles the cat except that being bigger, and nearly two feet long, it is bolder and fiercer. Like the cat, it climbs trees, and seeks its prey by surprise; like the cat it is delicate and cleanly, covering its urine with its paws, and it resembles the wolf in nothing except its cry, which often deceives the hunters, and induces them to think they hear a wolf and not a lynx. This animal also is rather more delicate than the cat; and after having once feasted upon its prey, will never return to it again, but hunts the woods for another. From hence may have arisen the common report of the lynx having, of all other quadrupeds, the shortest memory. This, however, is not the only idle story that has been propagated of it; as of its seeing with such perspicuity, as to perceive objects through walls and mountains; as of having its urine of such a quality, as to harden, and become a precious stone; with several others, propagated by ignorance or imposture.

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* Buffon.

The **SIAGUSH** and the **SERVAL** are both so like all the rest of the cat kind in disposition, that it is but repeating the same account once more to give their distinct history. As the lynx is found only in cold countries, so the siagush is to be met with only in the warm tropical climates. It is used, in the same manner as the ounce, for hunting; but it seems to have a property which the other has not; namely, that of being able to overtake its prey by pursuing it. Whether this is performed by having a finer scent than the former, or greater swiftness, we are not informed; being only told that when it overtakes either the gazelle or the antelope, it leaps upon their backs, and, getting forward, to their shoulders, scratches their eyes out, by which means they become an easy prey to the hunters. Some have called this animal the *lion's provider;* and it is said that when it calls him to pursue his prey, its voice very much resembles that of one man calling another.* From hence we may conjecture that this animal pursues its prey in full cry, and that the lion only follows to partake or seize the spoil. The same account is given also of the jackal; and very probably it may be true, not only of these animals, but of some others, since it is natural enough to suppose that the lion will pursue whenever he is taught to discover his prey.

We had one of those animals a few years ago sent over from the East-Indies, but it was not able to endure the change of climate, and it died in a very short time after it was brought to the Tower. Whether consumed by disease or not I cannot tell, but it seemed to be much slenderer than the cat or the lynx, and its ears were much longer; however, it is a very strong creature for its size, and has been known to kill a large dog in single combat:† nevertheless, it is, like all of the cat kind, except the lion, remarkable for its cowardice, and will never, except in cases of necessity, attack an animal that is its equal in strength or activity. For this reason, when brought into the field, and put upon a service of danger, it obstinately refuses, and is alert only in the pursuit of animals that are too feeble for resistance, or too timid to exert their strength.

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* Thevenot vol. 2. p. 114.

† Buffon.

From what has been said of this rapacious tribe, we perceive a similitude in the manners and dispositions of them all from the lion to the cat. The similitude of their internal conformation is still more exact the shortness of their intestines, the number of their teeth, and the structure of their paws. The first of this class is the lion, distinguishable from all the rest by his strength, his magnitude, and his mane.—The second is the tiger, rather longer than the lion, but not so tall, and known by the streaks and the vivid beauty of its robe ; including also the American tiger or cougar ; distinguishable by its size, next that of the tiger, its tawny colour, and its spots. The third is the panther and the leopard. The fourth is the ounce, not so large as any of the former, spotted like them, but distinguishable by the cream-coloured ground of its hair, and the great length of its tail, being above the length of its body. The fifth is the catamountain or tiger cat, less than the ounce, but differing particularly in having a shorter tail, and being streaked down the back like a tiger. The sixth is the short-tailed kind ; namely, the lynx, of the size of the former, but with a short tail streaked, and the tips of its ears tufted with black. The seventh is the siagush, differing from the lynx in not being mottled like it, in not being so large, and in having the ears longer, though tipped with black, as before. The eighth is the serval, resembling the lynx in its form, and the shortness of its tail ; streaked also like it, but not having the tips of his ears tufted. Lastly, the cat, wild and tame, with all its varieties ; all less than any of the former, but, like them, equally insidious, rapacious, and cruel.

This whole race may be considered as the most formidable enemy of mankind ; there are others indeed stronger, but they are gentle, and never offering injury till injured : there are others more numerous, but they are more feeble, and rather look for safety by hiding from man, than opposing him. These are the only quadrupeds that make good their ground against him ; and which may be said to keep some kingdoms of the earth in their own possession. How many extensive countries are there in Africa, where the wild beasts are so numerous, that man is deterred from living amongst them ; reluctantly giving up to the lion and the leopard, extensive tracts, that seem formed only for his delight and convenience ?

CHAPTER II.

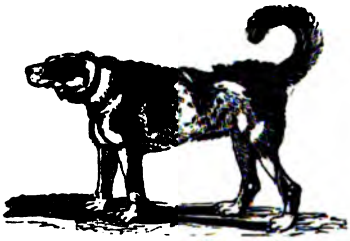
ANIMALS OF THE DOG KIND.

THE second class of carnivorous quadrupeds may be denominated those of the *dog kind.* This class is neither so numerous nor so powerful as the former, and yet neither so treacherous, rapacious, or cowardly. This class may be principally distinguished by their claws, which have no sheath, like those of the cat kind, but still continue at the point of each toe without a capability of being stretched forward, or drawn back. The nose also, as well as the jaw, of all the dog kind, is longer than in the cat ; the body is, in proportion, more strongly

Variety of the Greyhound, p. 133.

Mastiff, p. 132.

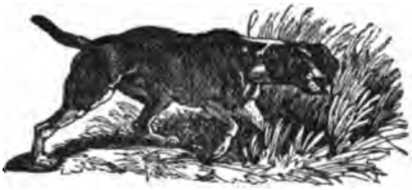
Bloodhound, p. 133.



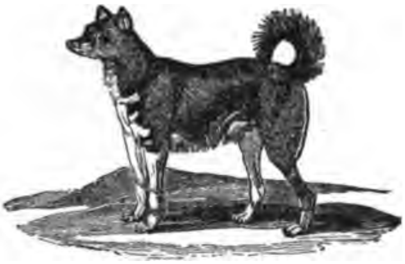
Newfoundland Dog, p. 132.

Terrier, p. 133.

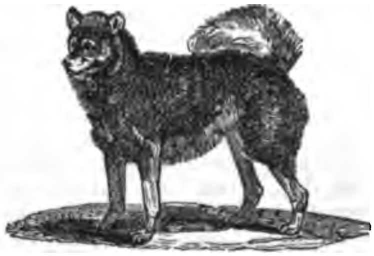
To face p. 126, vol. ii.



Spanish Pointer, p. 126.



American Wild Dog, p. 126.



Esquimaux Dog, p. 126.

To face p. 127, vol. ii.

made, and covered with hair instead of fur. There are many internal distinctions also; as in the intestines, which are much longer in the dog kind, than in those of the cat; the eye is not formed for night vision; and the olfactory nerves are diffused, in the dog kinds, upon a very extensive membrane within the skull.

If we compare the natural habitudes of this class with the former, we shall find that the dog kinds are not so solitary as those of the cat, but love to hunt in company, and encourage each other with their mutual cries. In this manner the dog and the jackal pursue their prey; and the wolf and fox, which are of this kind, though more solitary and silent among us, yet, in countries where less persecuted, and where they can more fearlessly display their natural inclinations, they are found to keep together in packs, and pursue their game with alternate howlings.

Animals of the dog kind want some of the advantages of the cat kind, and yet are possessed of others in which the latter are deficient.—Upon observing their claws, it will easily be perceived that they cannot, like cats, pursue their prey up the sides of a tree, and continue the chase among the branches; their unmanageable claws cannot stick in the bark and thus support the body up along the trunk, as we see the cat very easily perform: whenever, therefore, their prey flies up a tree from them, they can only follow it with their eyes, or watch its motions till hunger again brings it to the ground. For this reason, the proper prey of the dog kind, are only those animals that, like themselves, are unfitted for climbing; the hare, the rabbit, the gazelle, or the roebuck.

As they are, in this respect, inferior to the cat, so they exceed it in the sense of smelling; by which alone they pursue their prey with certainty of success, wind it through all its mazes, and tire it down by perseverance. It often happens, however, in the savage state, that their prey is either too much diminished, or too wary to serve for a sufficient supply. In this case, when driven to an extremity, all the dog kinds can live for some time upon fruits and vegetables, which, if they do not please the appetite, at least serve to appease their hunger.

Of all this tribe, the dog has every reason to claim the preference, being the most intelligent of all known quadrupeds, and the acknowledged friend of mankind. The dog,[*] independent of the beauty of his form, his vivacity, force, and swiftness, is possessed of all those internal qualifications, that can conciliate the affections of man, and make the tyrant a protector. A natural share of courage, an angry and ferocious disposition, renders the dog, in its savage state, a formidable enemy to all other animals: but these readily give way to very different qualities in the domestic dog, whose only ambition seems the desire to please; he is seen to come crouching along, to lay his force, his courage, and all his useful talents, at the feet of his master; he waits his orders, to which he pays implicit obedience; he consults his looks, and a single glance is sufficient to put him in motion; he is more

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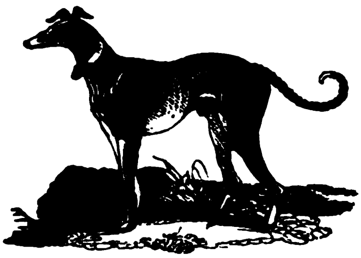
[*] The rest of this description of the dog is taken from Mr. Buffon; what I have added is marked as before.

Domestic Cat, p. 100

Bull Dog, p. 134.

Shepherd's Dog, p. 131.



Greyhound, p. 133.

To face p. 123, vol. ii.

these are the most sullen, and, even to a proverb, untameable.—They still preserve their fierce and treacherous spirit; and at those places where they are exposed to be seen among others, we often observe that while their keeper is familiar with the lion or the bear, yet he is apprehensive of the large panther, and keeps it bound with the shortest chain.

As the ounce differs from these in figure and size, so also it seems to differ in disposition, being more mild, tractable, and tame. These we often see as harmless and innocent as cats; and there is one at present in the Tower with which the keeper plays without the smallest apprehension.—I own I was not a little uneasy, at first, for the man, when he put his hand through the bars, and called the animal by its name; but I was a good deal surprised to see the creature, which one might suppose irritated by long confinement, come gently up to him, stroke his hand with its face, in the manner of a cat, and testify the utmost gentleness of disposition. The ounce, therefore, is remarkable for being easily tamed; and, in fact, it is employed all over the East for the purposes of hunting. Not, indeed, but the panthers themselves are sometimes used for this purpose, but they are never thoroughly subdued like the former, being usually brought to the field in a carriage, and kept chained and caged until they are shown the gazelle, or the leveret, which is their prey. This they pursue rather by three or four great springs than by running. If they seize it by this sudden effort, it finds no mercy; but if it escapes from this first effort, they never attempt to pursue, and appear quite disappointed and confounded at their mischance. It sometimes happens that they are so much enraged at it, that they attack even their employer, and his only resource to avoid their fury is to throw them some small pieces of meat, which he has brought with him for that purpose.

The ounce, however, is not so dangerous; and is treated with more confidence and familiarity. It is usually brought to the field hoodwinked behind one of the horsemen. When the game appears, the ounce is instantly uncovered, and shown where it lies; upon which the fierce creature darts like an arrow to the place, and seizes it at once, or, missing it, remains motionless on the place. It would be vain to attempt retrieving its disgrace, by continuing the pursuit; for although it bounds with greater agility than most other animals, yet i is slow and awkward in running, and has no means of finding the animal it pursues by the smell, as is common among those of the dog kind. From hence, therefore, it appears how much superior the European method of hunting is to that of the Asiatic; since whatever amusement this exercise affords must arise from the continuance of the chase, and from the fluctuation of doubt and expectation, which raise and depress the pursuers by turns. All this an Asiatic hunter is deprived of; and his greatest pleasure can scarcely be more than what among us is called *coursing*, in which the dog pursues the animal, and keeps it constantly in view.

But it must not be supposed that it is from choice the Asiatics use this method of chase; for, no doubt, werewere serviceable among them as they are in Europe, they would be employed for the same purposes But the fact is. that the extreme heat of the tropical climates producpearance, as any two animals the most distinct in Nature. Nothing appears to continue constant with them, but their internal conformation: different in the figure of the body, in the length of the nose, in the shape of the head, in the length and the direction of the ears and tail, in the colour, the quality, and the quantity of the hair; in short, different in every thing but that make of the parts which serve to continue the species, and keep the animal distinct from all others. It is this peculiar conformation, this power of producing an animal that can reproduce, that marks the kind, and approximates forms that at first sight seem never made for conjunction.

From this single consideration, therefore, we may at once pronounce all dogs to be of one kind, but which of them is the original of all the rest, which of them is the savage dog from whence such a variety of descendants have come down, is no easy matter to determine. We may easily, indeed, observe, that all those animals which are under the influence of man, are subject to great variations. Such as have been sufficiently independent, so as to choose their own climate, their own nourishment, and to pursue their own habitudes, preserve the original marks of Nature, without much deviation; and it is probable, that the first of these is even at this day very well represented in their descendants. But such as man has subdued, transported from one climate to another, controlled in their manner of living, and their food, have most probably been changed also in their forms; particularly the dog has felt these alterations more strongly than any other of the domestic kinds; for living more like man, he may be thus said to live more irregularly also, and, consequently, must have felt all those changes that such variety would naturally produce. Some other causes also may be assigned for this variety in the species of the dog: as he is perpetually under the eye of his master, when accident has produced any singularity in its productions, man uses all his art to continue this peculiarity unchanged; either by breeding from such as had those singularities, or by destroying such as happened to want them; besides, as the dog produces much more frequently than some other animals, and lives a shorter time, so the chance for its varieties will be offered in greater proportion.

But which is the original animal, and which is the artificial or accidental variety, is a question, which, as was said, is not easily resolved. If the internal structure of dogs of different sorts be compared with each other, it will be found, except in point of size, that in this respect they are exactly the same. This, therefore, affords no criterion. If other animals be compared with the dog internally, the wolf and the fox will be found to have the most perfect resemblance; it is probable, therefore, that the dog, which most nearly resembles the wolf or the fox externally, is the original animal of its kind: for it is natural to suppose, that as the dog most nearly resembles them internally, so he may be near them in external resemblance also, except where art or accident has altered his form. This being supposed, if we look among the number of varieties to be found in the dog, we shall not find one so like the wolf or the fox, as that which is called the *shepherd's dog*. This is that dog with long coarse hair on all parts except the nose, pricked ears, and a long nose, which is common enough among us, and receives his name from being principally used in guarding and attending on sheep. This seems to be the primitive animal of the kind; and we shall be the more confirmed in this opinion, if we attend to the different characters which climate produces in the animal, and the different races of dogs which are propagated in every country: and, in the first place, if we examine those countries which are still savage, or but half civilized, where it is most probable the dog, like his master, has received but few impressions from Art, we shall find the shepherd's dog, or one very like him, still prevailing amongst them. The dogs that have run wild in America, and in Congo, approach this form. The dog of Siberia, Lapland, and Iceland, of the Cape of Good Hope, of Madagascar, Madura, Calicut, and Malabar, have all a long nose, pricked ears, and resemble the shepherd's dog very nearly. In Guinea, the dog very speedily takes his form; for, at the second or third generation, the animal forgets to bark, his ears and his tail become pointed, and his hair drops off, while a coarser, thinner kind comes in the place. This sort of dog is also to be found in the temperate climates in great abundance, particularly among those who, preferring usefulness to beauty, employ an animal that requires very little instruction to be serviceable. Notwithstanding this creature's deformity, his melancholy and savage air, he is superior to all the rest of his kind in instinct; and without any teaching, naturally takes to tending flocks, with an assiduity and vigilance that at once astonishes, and yet relieves his master.

In more polished and civilized places, the dog seems to partake of the universal refinement; and, like the men, becomes more beautiful, more majestic, and more capable of assuming an education foreign to its nature. The dogs of Albany, of Greece, of Denmark, and of Ireland, are larger and stronger than those of any other kind. In France, Germany, Spain, and Italy, the dogs are of various kinds, like the men; and this variety seems formed by crossing the breed of such as are imported from various climes.

The shepherd's dog may, therefore, be considered as the primitive stock from whence these varieties are all derived. He makes the stem of that genealogical tree which has been branched out into every part of the world. This animal still continues pretty nearly in its original state among the poor in temperate climates; being transported into the colder regions, he grows less and more ugly among the Laplanders; but becomes more perfect in Iceland, Russia, and Siberia, where the climate is less rigorous, and the people more civilized.—Whatever differences there may be among the dogs of these countries, they are not very considerable, as they have all straight ears, long and thick hair, a savage aspect, and do not bark either so often or so loud as dogs of the more cultivated kind.

The shepherd's dog, transported into the temperate climates, and among people entirely civilized, such as England, France, and Germany, will be divested of his savage air, his pricked ears, his rough, long, and thick hair, and from the single influence of climate and food alone, will become either a matin, a mastiff, or a hound. These three seem the immediate descendants of the former; and from them the other varieties are produced.

The HOUND, the HARRIER, and the BEAGLE, seem all of the same kind ; for although the bitch is covered but by one of them, yet in her litters are found puppies resembling all three. This animal, transported into Spain or Barbary, where the hair of all quadrupeds becomes soft and long, will be there converted into the land-spaniel, and the water-spaniel, and these of different sizes.

The GREY MATIN HOUND, which is in the second branch, transported to the north, becomes the great Danish dog; and this, sent into the south becomes the grey-hound, of different sizes. The same, transported into Ireland, the Ukraine, Tartary, Epirus, and Albania, becomes the great wolf-dog, known by the name of the Irish wolf-dog.

MASTIFF, which is the third branch, and chiefly a native of England, when transported into Denmark, becomes the little Danish dog, and this little Danish dog, sent into the tropical and warm climates, becomes the animal called the TURKISH DOG, without hair. All these races, with their varieties, are produced by the influence of climate, joined to the different food, education, and shelter, which they have received among mankind. All other kinds may be considered as mongrel races, produced by the concurrence of these, and found rather by crossing the breed than by attending to the individual. " As these are extremely numerous, and very different in different countries, it would be almost endless to mention the whole ; besides, nothing but experience can ascertain the reality of these conjectures, although they have so much the appearance of probability ; and until that gives more certain information, we must be excused from entering more minutely into the subject.

" With regard to the dogs of our country in particular, the varieties are very great, and the number every day increasing. And this must happen in a country so open by commerce to all others, and where wealth is apt to produce capricious predilection. Here the ugliest and the most useless of their kinds will be entertained merely for their singularity ; and, being imported only to be looked at, they will lose even that small degree of sagacity which they possessed in their natural climates. From this importation of foreign useless dogs, our own native breed is, I am informed, greatly degenerated, and the varieties now to be found in England much more numerous than they were in the times of Queen Elizabeth, when Doctor Caius attempted their natural history. Some of those he mentions are no longer to be found among us, although many have since been introduced, by no means so serviceable as those which have been suffered to decay.

" He divides the whole race into three kinds. The first is, the generous kind, which consists of the terrier, the harrier, and the bloodhound ; the gaze-hound, the grey-hound, the leymmer and the tumbler ; all these are used for hunting. Then the spaniel, the setter, and the water-spaniel, or finder, were used for fowling ; and the spaniel gentle, or lap-dog for amusement. The second is the farm kind ; consisting of the shepherd's dog and the mastiff. And the third is the mongrel kind ; consisting of the wappe, the turnspit, and the dancer.

To these varieties we may add at present, the bull-dog, the Dutch mastiff the harlequin, the pointer, and the Dane, with a variety of lap-dogs which, as they are perfectly useless, may be considered as unworthy of a name.

"The Terrier is a small kind of hound,* with rough hair, made use of to force the fox or the badger out of their holes; or rather to give notice, by their barking, in what part of their kennel the fox or badger resides, when the sportsmen intend to dig them out.

"The Harrier, as well as the beagle and the fox-hound, are used for hunting; of all other animals, they have the quickest and most distinguishing sense of smelling. The properly breeding, matching, and training these, make up the business of many men's lives.

"The Blood-hound was a dog of great use, and in high esteem among our ancestors. Its employ was to recover any game that had escaped from the hunter, or had been killed, and stolen out of the forest. But it was still more employed in hunting thieves and robbers by their footsteps. At that time, when the country was less peopled than at present, and when, consequently, the footsteps of one man were less crossed and obliterated by those of others, this animal was very serviceable in such pursuits; but at present, when the country is every where peopled, this variety is quite worn out; probably because it was found of less service than formerly.

"The Gase-hound hunted, like our grey-hounds, by the eye and not by the scent. It chased indifferently the fox, hare, or buck. It would select from the herd the fattest and fairest deer, pursue it by the eye, and if lost recover it again with amazing sagacity. This species is now lost or unknown among us.

"The Grey-hound is very well known at present, and was formerly held in such estimation, that it was the peculiar companion of a gentleman; who, in the times of semi-barbarism, was known by his horse, his hawk, and his grey-hound. Persons under a certain rank of life are forbidden, by some late game-laws, from keeping this animal; wherefore, to disguise it the better, they cut off its tail.

"The Leymmer is a species now unknown to us. It hunted both by scent and sight, and was led in a leyme or thong, from whence it received its name.

"The Tumbler was less than the hound, more scraggy and had pricked ears; so that by the description it seems to answer to the modern lurcher. This took its prey by mere cunning, depending neither on the goodness of its nose nor its swiftness. If it came into a warren, it neither barked nor ran on the rabbits; but seemingly inattentive, approached sufficiently near till it came within reach, and then seized them by a sudden spring.

"The Land Spaniel, which probably had its name from Spain, where it might have acquired the softness of its hair, is well known at present. There are two varieties of this kind; namely the Slater, used in hawking to spring the game; and the Setter, that crouches down when it scents the birds, till the net be drawn over them. I have read somewhere that the famous poet, Lord Surry, was the first who taught dogs to set; it being an amusement to this day only known in England.

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* British Zoology

"The Water-Spaniel was another species used in fowling. —This seems to be the most docile of all the dog kind; and this docility is particularly owing to his natural attachment to man. Many other kinds will not bear correction; but this patient creature, though very fierce to strangers, seems unalterable in his affections; and blows and ill usage, seem only to increase his regard.

"The Lap-dog, at the time of Doctor Caius, was of Maltese breed; at present it comes from different countries; in general, the more awkward or extraordinary these are, the more they are prized.

"The Shepherd's dog has been already mentioned, and as for the Mastiff he is too common to require a description. Doctor Caius tells us, that three of these were reckoned a match for a bear, and four for a lion. However, we are told that three of them overcame a lion in the time of King James the first; two of them being disabled in the combat, the third obliged the lion to seek for safety by flight.

"As to the last division, namely, of the Wappe, the Turnspit, and the Dancer, these were mongrels, of no certain shape, and made use of only to alarm the family, or, being taught a variety of tricks, were carried about as a show.

"With regard to those of later importation, the Bull-dog, as Mr. Buffon supposes, is a breed between the small Dane and the English mastiff. The large Dane is the tallest dog that is generally bred in England. It is somewhat between a mastiff and a grey-hound in shape, being more slender than the one and much stronger than the other.—They are chiefly used rather for show than service, being neither good in the yard nor the field. The highest are most esteemed; and they generally cut off their ears to improve their figure, as some absurdly suppose. The harlequin is not much unlike the small Dane, being an useless animal, somewhat between an Italian grey-hound and a Dutch mastiff. To these several others might be added, such as the pug-dog, the black breed, and the pointer; but in fact the varieties are so numerous as to fatigue even the most ardent curiosity."

Of those of the foreign kinds, I shall mention only three, which are more remarkable than any of the rest. The Lion-Dog greatly resembles that animal, in miniature, from whence it takes the name. The hair of the fore-part of its body is extremely long, while that of the hinder-part is as short. The nose is short, the tail long, and tufted at the point, so that in all these particulars it is entirely like the lion. However, it differs very much from that fierce animal in nature and disposition, being one of the smallest animals of its kind, extremely feeble, timid, and inactive. It comes originally from Malta, where it is found so small that women carry it about in their sleeves.

That animal falsely called the *Turkish-dog*, differs greatly from the rest of the kind, in being entirely without hair. The skin, which is perfectly bare, is of a flesh colour, with brown spots; and their figure, at first view, is rather disgusting. These seem to be of the small Danish breed, brought into a warm climate, and there, by a succession of generations, divested of their hair. For this reason, they are extremely chilly, and unable to endure the cold of our climate; and even in the midst of summer, they continue to shiver as we see men in a frosty day Their spots are brown, as was said, well-marked, and easily distinguishable in summer, but in the cold of winter they entirely disappear. They are called the Turkish breed, although brought from a much warmer climate; for some of them have been known to come from the warmest parts of Africa and the East-Indies.

"The last variety, and the most wonderful of all that I shall mention, is the Great Irish Wolf-dog, that may be considered as the first of the canine species, This animal, which is very rare, even in the only country in the world where it is to be found, is rather kept for show than use; there being neither wolves nor any other formidable beasts of prey in Ireland, that seem to require so powerful an antagonist. The wolf dog is therefore bred up in the houses of the great, or such gentlemen as choose to keep him as a curiosity, being neither good for hunting the hare, the fox, nor the stag, and equally unserviceable as a house dog. Nevertheless he is extremely beautiful and majestic to appearance, being the greatest of the dog kind to be seen in the world. The largest of those I have seen, and I have seen above a dozen, was about four feet high, or as tall as a calf of a year old. He was made extremely like a grey-hound, but rather more robust, and inclining to the figure of the French matin, or the great Dane. His eye was mild, his colour white, and his nature seemed heavy and phlegmatic. This I ascribe to his having been bred up to a size beyond his nature, for we see in man, and all other animals, that such as are overgrown are neither so vigorous nor alert as those of a more moderate stature. The greatest pains have been taken with these to enlarge the breed, both by food and matching. This end was effectually obtained, indeed, for the size was enormous; but, as it seemed to me, at the expense of the animal's fierceness, vigilance and sagacity. However, I was informed otherwise; the gentlemen who bred them assuring me that a mastiff would be nothing when opposed to one of them, who generally seized their antagonist by the back: he added, that they would worry the strongest bull-dogs, in a few minutes, to death But this strength did not appear either in their figure or their inclinations; they seem rather more timid than the ordinary race of dogs; and their skin was much thinner, and consequently less fitted for combat. Whether, with these disadvantages they were capable, as I was told, of singly coping with bears, others may determine; however, they have but few opportunities, in their own country, of exerting their strength, as all wild carnivorous animals there are only of the vermin kind. Mr. Buffon seems to be of opinion that these are the true Molossian dogs of the ancients; he gives no reason for this opinion; and I am apt to think it ill-grounded. Not to trouble the reader with a tedious critical disquisition, which I have all along avoided, it will be sufficient to observe, that Nemesianus, in giving directions for the choice of a bitch, advises to have one of Spartan or Molossian breed; and, among several other perfections, he says that the ears should be dependent, and fluctuate as she runs.* This, however, is by no means the case with the Irish wolf-dog, whose ears resemble those of the grey-hound, and are far from fluctuating with the animal's motion. But of whatever kinds these dogs may be, whether known among the ancients, or whether produced by a later mixture, they are now almost quite worn away, and are very rarely to be met with now, even in Ireland. If carried to other countries, they soon degenerate; and even at home, unless great care be taken, they quickly alter. They were once employed in clearing the island of wolves, which infested it in great plenty; but these being destroyed, the dogs also are wearing away, as if Nature meant to blot out the species when they had no longer any services to perform.

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* Elige tunc cursu facilem, facilemque recursu,
In Lacedæmonio natam seu rure Molosso—
Renibus ampla satis validis, diductaque coxas
Cuique nimis molles fluitent in cursibus aures.
NEMESIAN

"In this manner several kinds of animals fade from the face of Nature, that were once well known, but are now seen no longer. The enormous elk of the same kingdom, that, by its horns, could not have been less than eleven feet high, the wolf, and even the wolf-dog are extinct, or only continued in such a manner as to prove their former plenty and existence. From hence, it is probable, that many of the nobler kinds of dogs, of which the ancients have given us such beautiful descriptions, are now utterly unknown; since among the whole breed we have not one that will venture to engage the lion or the tiger in single combat. The English bull-dog is perhaps the bravest of the kind; but what are his most boasted exploits to those mentioned of the Epirotic dogs by Pliny, or the Indian dogs by Ælian. The latter gives us a description of a combat between a dog and a lion, which I will take leave to translate.

"When Alexander was pursuing his conquests in India, one of the principal men of that country was desirous of showing him the value of the dogs, which his country produced. Bringing his dog into the king's presence, he ordered a stag to be let loose before him, which the dog despised as an unworthy enemy, remained quite regardless of the animal, and never once stirred from his place. His master then ordered a wild boar to be set out; but the dog thought even this a despicable foe, and remained calm and regardless as before. He was next tried with a bear; but still despising his enemy, he only waited for an object more worthy of his courage and his force. At last they brought forth a tremendous lion, and then the dog acknowledged his antagonist, and prepared for combat. He instantly discovered a degree of ungovernable ardour; and, flying at the lion with fury, seized him by the throat, and totally disabled him from resistance. Upon this, the Indian, who was desirous of surprising the king, and knowing the constancy and bravery of his dog, ordered his tail to be cut off; which was easily performed as the bold animal was employed in holding the lion. He next ordered one of his legs to be broken; which, however, did not in the least abate the dog's ardour, but he still kept his hold as before. Another leg was then broken; but the dog, as if he had suffered no pain, only pressed the lion still the more. In this cruel manner, all his legs were cut off, without abating his courage; and at last, when even his head was separated from his body, the jaws seemed to keep their former hold. A sight so cruel did not fail to affect the king with very strong emotions, at once pitying the dog's fate, and admiring his fortitude. Upon which the Indian seeing him thus moved, presented him with four dogs of the same kind, which, in some measure, alleviated his uneasiness for the loss of the former.

"The breed of dogs, however, in that country, is at present very much inferior to what this story seems to imply; since, in many places, instead of dogs, they have animals of the cat kind for hunting. In other places, also, this admirable and faithful animal, instead of being applied to his natural uses, is only kept to be eaten. All over China, there are dog-butchers, and shambles appointed for selling their flesh. In Canton, particularly, there is a street appointed for that purpose; and, what is very extraordinary, wherever a dog-butcher appears, all the dogs of the place are sure to be in full cry after him; they know their enemy, and persecute him as far as they are able." Along the coast of Guinea, their flesh is esteemed a delicacy by the Negroes; and they will give one of their cows for a dog. But, among this barbarous and brutal people, scarce any thing that has life comes amiss; and they may well take up with a dog, since they consider toads, lizards, and even the flesh of the tiger itself, as a dainty. It may, perhaps, happen that the flesh of this animal, which is so indifferent in the temperate climates, may assume a better quality in those which are more warm; but it is more than probable that the diversity is rather in man than in the flesh of the dog; since in the cold countries the flesh is eaten with equal appetite by the savages; and they have their dog-feasts in the same manner as we have ours for venison.

In our climate, the wild animals that most approach the dog are the wolf and the fox; these, in their internal conformation, greatly resemble each other, and yet in their natures are very distinct. The ancients asserted that they bred together; and I am assured, by credible persons, that there are many animals in this country bred between a dog and a fox. However, all the endeavours of Mr. Buffon to make them engender, as he assures us, were ineffectual. For this purpose, he bred up a young wolf, taken in the woods, at two months old, with a matin dog of the same age. They were shut up together, without any other, in a large yard, where they had a shelter for retiring.—They neither of them knew any other individual of their kind, nor even any other man, but he who had the charge of feeding them. In this manner they were kept for three years; still with the same attention, and without constraining or tying them up. During the first year the young animals played with each other continually, and seemed to love each other very much. In the second year, they began to dispute about their victuals, although they were given more than they could use. The quarrel always began on the wolf's side. They were brought their food, which consisted of flesh and bones, upon a large wooden platter, which was laid on the ground. Just as it was put down, the wolf, instead of falling to the meat, began by driving off the dog; and took the platter in its teeth so expertly, that it let nothing of what it contained fall upon the ground, and in this manner carried it off; but as the wolf could not entirely escape, it was frequently seen to run with the platter round the yard five or six times, still carrying it in a position that none of its contents could fall. In this manner it would continue running, only now and then stopping to take breath, until the dog coming up, the wolf would leave the victuals to attack him. The dog, however, was the stronger of the two, but as it was more gentle, in order to secure him from the wolf's attack he had a collar put round his neck. In the third year, the quarrels of these ill-paired associates were more vehement, and their combats more frequent; the wolf, therefore, had a collar put about its neck, as well as the dog, who began to be more fierce and unmerciful. During the two first years, neither seemed to testify the least tendency towards engendering; and it was not till the end of the third, that the wolf, which was the female, showed the natural desire, but without abating either in its fierceness or obstinacy. This appetite rather increased than repressed their mutual animosity; they became every day more untractable and ferocious, and nothing was heard between them but the sounds of rage and resentment. They both, in less than three weeks, became remarkably lean, without ever approaching each other, but to combat. At length, their quarrels became so desperate, that the dog killed the wolf, who was become more weak and feeble; and he was soon after himself obliged to be killed, for upon being set at liberty, he instantly flew upon every animal he met, fowls, dogs, and even men themselves not escaping his savage fury.

The same experiment was tried upon foxes, taken young, but with no better success, they were never found to engender with dogs; and our learned naturalist seems to be of opinion that their natures are too opposite ever to provoke mutual desire. One thing, however, must be remarked, that the animals on which he tried his experiments were rather too old when taken, and had partly acquired their natural savage appetites, before they came into his possession. The wolf, as he acknowledges, was two or three months old before it was caught, and the foxes were taken in traps. It may, therefore, be easily supposed, that nothing could ever after thoroughly tame those creatures that had been suckled in the wild state, and had caught all the habitudes of the dam I have seen these animals, when taken earlier in the woods, become very tame; and, indeed, they rather were displeasing by being too familiar than too shy. It were to be wished that the experiment were tried upon such as these; and it is more than probable that it would produce the desired success. Nevertheless, these experiments are sufficient to prove that neither the wolf nor the fox are of the same nature with the dog, but each of a species perfectly distinct, and their joint produce most probably unfruitful.

The dog, when first whelped, is not a completely finished animal In this kind, as in all the rest which bring forth many at a time, the young are not so perfect as in those which bring forth one or two. They are always produced with the eyes closed, the lids being held together, not by sticking, but by a kind of thin membrane, which is torn as soon as the upper eye-lid becomes strong enough to raise it from the under. In genera, their eyes are not opened till ten or twelve days old. During that time, the bones of the skull are not completed, the body is puffed up, the nose is short, and the whole form but ill-sketched out. In less than a month the puppy begins to use all its senses; and from thence makes hasty advances to its perfection At the fourth month, the dog loses some of his teeth, as in other animals, and these are renewed by such as never fall. The number of

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31
25 : 67

these amount to forty-two, which is twelve more than is found in any of the cat kind, which are known never to have above thirty. The teeth of the dog being his great and only weapon, are formed in a manner much more serviceable than those of the former; and there is scarce any quadruped that has a greater facility in rending, cutting, or chewing its food. He cuts with his incisors, or fore-teeth, he holds with his four great canine teeth, and he chews his meat with his grinders; these are fourteen in number, and so placed that when the jaws are shut, there remains a distance between them, so that the dog by opening his mouth ever so wide, does not loose the power of his jaws. But it is otherwise in the cat kind, whose incisors, or cutting-teeth, are very small, and whose grinding-teeth, when brought together, touch more closely than those of the dog, and, consequently have less power. Thus, for instance, I can squeeze any thing more forcibly between my thumb and fore-finger, where the distance is greater, than between any other two fingers, whose distance from each other is less.

This animal is capable of reproducing at the age of twelve months,* goes nine weeks with young, and lives to about the age of twelve. Few quadrupeds are less delicate in their food; and yet there are many kinds of birds which the dog will not venture to touch. He is even known, although in a savage state, at abstain from injuring some, which one might suppose he had every reason to oppose. The dogs and the vultures which live wild about Grand Cairo in Egypt (for the Mahometan law has expelled this useful animal from human society,) continue together in a very sociable and friendly manner.† As they are both useful in devouring such carcasses as might otherwise putrefy, and thus infect the air, the inhabitants supply them with provisions every day, in order to keep them near the city. Upon these occasions, the quadrupeds and birds are often seen together, tearing the same piece of flesh, without the least enmity; on the contrary, they are known to live together with a kind of affection, and bring up their young in the same nest.

Although the dog is a voracious animal, yet he can bear hunger for a very long time. We have an instance, in the Memoirs of the Academy of Sciences, of this kind, in which a bitch that had been forgotten in a country-house, lived forty days without any other nourishment than the wool of a quilt which she had torn in pieces. It should seem that water is more necessary to the dog than food; he drinks often, though not abundantly; and it is commonly believed, that when abridged in water, he runs mad. This dreadful malady, the consequences of which are so well known, is the greatest inconvenience that results from the keeping this faithful domestic. But it is a disorder by no means so frequent as the terrors of the timorous would suppose; the dog has been often accused of madness, without a fair trial; and some persons have been supposed to receive their deaths from his bite, when either their own ill-grounded fears, or their natural disorders, were the true cause

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* To this description I will beg leave to add a few particulars from Linnæus, as I find them in the original. Vomitus gramina purgatur: cacat supra lapidem. Album græcum antisepticum summum. Mingit ad latus (this, however, not till the animal is nine months old) cum hospite sæpes centies. Odorat anum alterius. Procis rixantibus crudelis. Menstruans coit cum variis. Mordet illa illos. Cohæret copula junctus."

† Hasselquist Iter. Palæstin. p. 232.

THE WOLF.

The dog and the wolf are so very much alike internally, that the most expert anatomists can scarce perceive the difference ; and it may be asserted also, that, externally, some dogs more nearly resemble the wolf than they do each other. It was this strong similitude that first led some naturalists to consider them as the same animal, and to look upon the wolf as the dog in its state of savage freedom ; however, this opinion is entertained no longer; the natural antipathy those two animals bear to each other ; the longer time which the wolf goes with young than the dog, the one going over a hundred days, and the other not quite sixty ; the longer period of life in the former than the latter, the wolf living twenty years, the dog not fifteen ; all sufficiently point out a distinction, and draw a line that must forever keep them asunder.

The wolf, from the tip of the nose to the insertion of the tail, is about three feet seven inches long, and about two feet five inches high; which shows him to be larger than our great breed of mastiffs, which are seldom found to be above three feet by two. His colour is a mixture of black, brown and grey, extremely rough and hard, but mixed towards the roots with a kind of ash-coloured fur. In comparing him to any of our well-known breed of dogs, the great Dane or mongrel grey-hound, for instance, he will appear to have the legs shorter, the head larger, the muzzle thicker, the eyes smaller, and more separated from each other, and the ears shorter and straighter. He appears in every respect stronger than the dog; and the length of his hair contributes still more to his robust appearance. The feature which principally distinguishes the visage of the wolf from that of the dog is the eye, which opens slantingly upwards in the same direction with the nose ; whereas, in the dog, it opens more at right angles with the nose, as in man. The tail, also, in this animal, is long and bushy ; and he carries it rather more between his hind legs than the dog is seen to do. The colour of the eye-balls in the wolf are of a fiery green, and give his visage a fierce and formidable air, which his natural disposition does by no means contradict.*

The wolf is one of those animals whose appetite for animal food is the most vehement ; and whose means of satisfying this appetite are the most various. Nature has furnished him with strength, cunning, agility, and all those requisites which fit an animal for pursuing, overtaking, and conquering its prey ; and yet, with all these, the wolf most frequently dies of hunger, for he is the declared enemy of man. Being long proscribed, and a reward offered for his head, he is obliged to fly from human habitations, and to live in the forest, where the few wild animals to be found there escape him either by their swiftness or their art; or are supplied in too small a proportion to satisfy his rapacity

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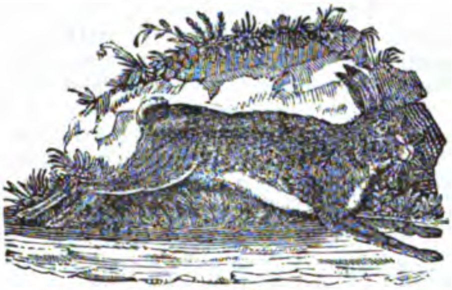
* The rest of this history of the wolf is taken from Mr. Buffon ; and I look upon it as a complete model for natural history. If I add or differ, I mark it as usual

Wolf, p. 140.



Hare, p. 179.

Fox, p. 146.

Rabbit, p. 183.

To face p. 140, vol. ii.

He is naturally dull and cowardly ; but frequently disappointed, and, as often reduced to the verge of famine, he becomes ingenious from want, and courageous from necessity. When pressed with hunger, he braves danger, and comes to attack those animals which are under the protection of man, particularly such as he can readily carry away, lambs, sheep, or even dogs themselves, for all animal food becomes then equally agreeable. When this excursion has succeeded, he often returns to the charge, until having been wounded, or hard pressed by the dogs or the shepherds, he hides himself by day in the thickest coverts and only ventures out at night ; he then sallies forth over the country, keeps peering round the villages, carries off such animals as are not under protection, attacks the sheepfolds, scratches up and undermines the thresholds of doors where they are housed, enters furious, and destroys all, before he begins to fix upon and carry off his prey. When these sallies do not succeed, he then returns to the thickest part of the forest, content to pursue those smaller animals, which, even when taken, afford him but a scanty supply. He then goes regularly to work, follows by the scent, opens to the view, still keeps following, hopeless himself of overtaking the prey, but expecting that some other wolf will come in to his assistance, and then content to share the spoil. At last, when his necessities are very urgent, he boldly faces certain destruction ; he attacks women and children, and sometimes ventures even to fall upon men, becomes furious by his continual agitations, and ends his life in madness.

The wolf, as well externally as internally, so nearly resembles the dog, that he seems modelled upon the same plan ; and yet he only offers the reverse of the model. If his form be like, his nature is so different, that he only preserves the ill-qualities of the dog, without any of his good ones. Indeed, they are so different in their dispositions, that no two animals can have a more perfect antipathy to each other. A young dog shudders at the sight of a wolf ; he even shuns his scent, which, though unknown, is so repugnant to his nature, that he comes trembling to take protection near his master. A dog who is stronger, and who knows his strength, bristles up at the sight, testifies his animosity, attacks him with courage, endeavours to put him to flight, and does all in his power to rid himself of a presence that is hateful to him.—They never meet without either flying or fighting ; fighting for life and death, and without mercy on either side. If the wolf is the stronger, he tears and devours his prey : the dog, on the contrary, is more generous and contents himself with his victory ; he does not seem to think that *the body of a dead enemy smells well ;* he leaves him where he falls, to serve as food for birds of prey, or for other wolves, since they devour each other ; and when one wolf happens to be desperately wounded, the rest track him by his blood, and are sure to show him no mercy.

The dog, even in his savage state, is not cruel ; he is easily tamed, and continues firmly attached to his master. The wolf, when taken young, becomes tame, but never has an attachment : Nature is stronger in him than education : he resumes with age his natural dispositions, and returns as soon as he can to the woods from whence he was taken Dogs, even of the dullest kinds, seek the company of other animals ;

they are naturally disposed to follow and accompany other creatures besides themselves; and even by instinct, without any education, take to the care of flocks and herds. The wolf, on the contrary, is the enemy of all society; he does not even keep much company with those of his kind. When they are seen in packs together, it is not to be considered as a peaceful society, but a combination for war; they testify their hostile intentions, by their loud howlings, and, by their fierceness, discover a project for attacking some great animal, such as a stag or a bull, or to destroy some more redoubtable watch-dog. The instant their military expedition is completed, their society is at an end; they then part, and each returns in silence to his solitary retreat. There is not even any strong attachments between the male and female; they seek each other only once a year, and remain but a few days together; they always couple in winter; at which time several males are seen following one female, and this association is still more bloody than the former; they dispute most cruelly, growl, bark, fight, and tear each other; and it sometimes happens that the majority kill the wolf, which has been chiefly preferred by the female. It is usual for the she wolf to fly from them all with him she has chosen; and watches this opportunity when the rest are asleep.

The season for coupling does not continue above twelve or fifteen days; and usually commences among the oldest, those which are young being later in their desires. The males have no fixed time for engendering, they pass from one female to the other, beginning at the end of December, and ending at the latter end of February. The time of pregnancy is about three months and a half; and the young wolves are found from the latter end of April to the beginning of July. The long continuance of the wolf's pregnancy is sufficient to make a distinction between it and the dog, did not also the fiery fierceness of their eyes, the howl instead of barking, and the greater duration of its life, leave no doubt of its being an animal of its own particular species. In other respects, however, they are entirely alike; the wolf couples exactly like the dog, the parts are formed in the same manner, and their separation hindered by the same cause. When the she wolves are near their bringing forth they seek some very tufted spot, in the thickest part of the forests; in the middle of this they make a small opening, cutting away the thorns and briars with their teeth, and afterwards carry thither a great quantity of moss, which they form into a bed for their young ones. They generally bring forth five or six, and sometimes even nine at a litter. The cubs are brought forth, like those of the bitch, with the eyes closed; the dam suckles them for some weeks, and teaches them betimes to eat flesh, which she prepares for them, by chewing it first herself. Some time after she brings them stronger food, hares, partridges, and birds yet alive. The young wolves begin by playing with them, and end by killing them. The dam then strips them of their feathers, tears them in pieces, and gives to each of them a share. They do not leave the den where they have been littered, till they are six weeks or two months old. They then follow the old one, who leads them to drink to the trunk of some old tree, where the water has settled, or at some pool in the neighbourhood. If she apprehends any danger, she instantly conceals them in the first conv sient place, or brings them back to their former retreat. In this manner they follow her for some months; when they are attacked, she defends them with all her strength, and more than usual ferocity. Although at other times more timorous than the male, at that season she becomes bold and fearless; willing perhaps to teach the young ones future courage by her own example. It is not till they are about ten or twelve months old, and until they have shed their first teeth, and completed the new, that she thinks them in a capacity to shift for themselves. Then when they have acquired arms from Nature, and have learned industry and courage from her example, she declines all future care of them, being again engaged in bringing up a new progeny.

The males and females are in a capacity to engender when two years old. It is probable that the females of this species, as well as of most others, are sooner completed than the males; but this is certain, that they never desire to copulate until their second winter; from whence we may suppose that they live fifteen or twenty years; for allowing three years for their complete growth, this multiplied by seven, gives them a life of twenty-one; most animals, as has been observed, living about seven times the number of years which they take to come to perfection. Of this, however, there is as yet no certainty, no more than of what huntsmen assert, that in all the litters there are more males than females. From them also we learn, that there are some of the males who attach themselves to the female, who accompany her during her gestation, until the time of bringing forth, when she hides the place of her retreat from the male, lest he should devour her cubs. But after this, when they are brought forth, that he then takes the same care of them as the female, carries them provisions, and, if the dam should happen to be killed, rears them up in her stead.

The wolf grows gray as he grows old, and his teeth wear, like those of most other animals, by using. He sleeps when his belly is full, or when he is fatigued, rather by day than night; and always, like the dog, is very easily waked. He drinks frequently; and in times of drought, when there is no water to be found in the trunks of old trees, or in the pools about the forest, he comes often, in the day, down to the brooks, or the lakes in the plain. Although very voracious, he supports hunger for a long time, and often lives four or five days without food, provided he be supplied with water.

The wolf has great strength, particularly in his fore parts, in the muscles of his neck and jaws. He carries off a sheep in his mouth without letting it touch the ground, and runs with it much swifter than the shepherds who pursue him; so that nothing but the dogs can overtake, and oblige him to quit his prey. He bites cruelly, and always with greater vehemence in proportion as he is least resisted; for he uses precautions with such animals as attempt to stand upon the defensive. He is ever cowardly, and never fights but when under a necessity of satisfying hunger, or making good his retreat. When he is wounded by a bullet, he is heard to cry out; and yet, when surrounded by the peasants, and attacked with clubs, he never howls as the dog under correction, but defends himself in silence, and dies as hard as he lived.

His nature is, in fact, more savage than that of the dog; he has less sensibility and greater strength. He travels, runs, and keeps plundering for whole days and nights together. He is in a manner indefatigable; and perhaps of all animals he is the most difficult to be hunted down. The dog is good natured and courageous; the wolf, though savage, is ever fearful. If he happens to be caught in a pit-fall, he is for some time so frightened and astonished, that he may be killed without offering to resist, or taken alive without much danger. At that instant, one may clap a collar round his neck, muzzle him, and drag him along, without his ever giving the least signs of anger or resentment. At all other times he has his senses in great perfection; his eye, his ear, and particularly his sense of smelling, which is even superior to the two former. He smells a carcass at more than a league's distance; he also perceives living animals a great way off, and follows them a long time upon the scent. Whenever he leaves the wood, he always takes care to go out against the wind. When just come to its extremity, he stops to examine, by his smell, on all sides, the emanations that may come either from his enemy or his prey, which he very nicely distinguishes. He prefers those animals which he kills himself to those he finds dead; and yet he does not disdain these when no better is to be had. He is particularly fond of human flesh; and perhaps, if he was sufficiently powerful, he would eat no other. Wolves have been seen following armies, and arriving in numbers upon the field of battle, where they devoured such dead bodies as were left upon the field, or but negligently interred. These, when once accustomed to human flesh, ever after seek particularly to attack mankind, and choose to fall upon the shepherd rather than his flock. We have had a late instance of two or three of these keeping a whole province, for more than a month, in a continual alarm.

It sometimes happens that a whole country is called out to extirpate these most dangerous invaders. The hunting the wolf is a favourite diversion among the great of some countries; and it must be confessed it seems to be the most useful of any. These animals are distinguished by the huntsmen into the *young wolf*, the *old wolf*, and the *great wolf*. They are known by the prints of their feet; the older the wolf, the larger the track he leaves. That of the female is narrower and longer than that of the male. It is necessary to have a very good starter to put up the wolf, and it is even convenient to use every art to encourage him in his pursuit; for all dogs have a natural repugnance against this animal, and are but cold in their endeavours. When the wolf is once put up, it is then proper to have grey-hounds to let fly at him, in leashes one after the other. The first leash is sent after him in the beginning, seconded by a man on horseback; the second are let loose about half a mile further, and the third when the rest of the dogs come up with, and begin to bait him. He for a long time keeps them off, stands his ground, threatens them on all sides, and often gets away; but usually the hunters arriving, come in aid of the dogs, and help to despatch him with their cutlasses. When the animal is killed, the dogs testify no appetite to enjoy their victory, but leave him where he falls a frightful spectacle, and even in death hideous.

The wolf is sometimes also hunted with harriers; but as he always goes straight forward, and often holds his speed for a whole day together, this kind of chase is tedious and disagreeable, at least if the harriers be not assisted by grey-hounds, who may harass him at every view. Several other arts have been also used to take and destroy this noxious animal. He is surrounded and wounded by men and large house-dogs; he is secured in traps; he is poisoned by carcasses, prepared and placed for that purpose, and is caught in pit-falls. "Gesner tells us of a friar, a woman, and a wolf, being taken in one of these, all in the same night. The woman lost her senses with the fright, the friar his reputation, and the wolf his life." All these disasters however, do not prevent this animal's multiplying in great numbers, particularly in countries where the woods are plenty France, Spain, and Italy, are greatly infested with them; but England, Ireland, and Scotland, are happily set free.

King Edgar is said to be the first who attempted to rid this kingdom of such disagreeable inmates, by commuting the punishment for certain crimes into the acceptance of a numberof wolves' tongues from each criminal.* However, some centuries after, these animals were again increased to such a degree as to become the object of royal attention; accordingly Edward the First issued out his mandate to one Peter Corbet to superintend aud assist in the destruction of them. They are said to have infested Ireland long after they were extirpated in England; however, the oldest men in that country remember nothing of these animals; and it is probable that there have been none there for more than a century past. Scotland also is totally free.

The colour of this animal differs according to the different climates where it is bred, and often changes even in the same country. Besides the common wolves which are found in France and Germany, there are others with thicker hair, inclining to yellow. These are more savage and less noxious than the former, neither approaching the flocks nor habitations, and living rather by the chase than rapine, In the northern climates there are found some quite black, and some white all over. The former are larger and stronger than those of any other kinds.

The species is very much diffused in every part of the world, being found in Asia, Africa, and America, as well as Europe. The wolves of Senegal resemble those of France, except that they are larger and much fiercer, than those of Europe. Those of Egypt are smaller than those of Greece. In the east, the wolf is trained up for a show, being taught to dance and play tricks; and one of these thus educated often sells for four or five hundred crowns. "It is said that in Lapland the wolf will never attack a rein-deer that is seen haltered; for this wary animal, being well acquainted with the nature of a trap, suspects one whenever it perceives a rope. However, when he sees the deer entirely at liberty, he seldom fails to destroy it.

"The wolf of North America is blacker and much less than those in other parts of the world, and approaches nearer in form to the dog than those of the ordinary kind.* In fact they were made use of as such by the savages till the Europeans introduced others; and even now, on the remoter shores, or the more inland parts of the country the savages still make use of these animals in hunting. They are very tame and gentle; and those of this kind that are wild, are neither so large nor so fierce as an European wolf, nor do they ever attack mankind. They go together in large packs by night to hunt the deer, which they do as well as any dogs in England; and it is confidently asserted that one of them is sufficient to run down a deer.† Whenever, they are seen along the banks of those rivers near which the wandering natives pitch their huts, it is taken for granted that the bison or the deer are not far off: and the savages affirm that the wolves come with the tidings, in order to have the garbage, after the animal has been killed by the hunters. Catesby adds a circumstance relative to these animals, which, if true, invalidates many of Mr. Buffon's observations in the foregoing history. He asserts, that these being the only dogs used by the Americans, before the arrival of the Europeans among them, they have since engendered together, and that their breed has become prolific; which proves the dog and the wolf to be of the same species. It were to be wished that this fact were better ascertained; we should then know to a certainty in what degree the dog and wolf resemble each other, as well in nature as in conformation; we might then, perhaps, be enabled to improve the breed of our dogs, by bringing them back to their native forms and instincts; we might, by crossing the strain, restore that race of those bold animals which the ancients assure us were more than a match for the lion."

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* British Zoology, p. 62.

However this animal may be useful in North America, the wolf of Europe is a very noxious animal, and scarce any thing belonging to him is good, except his skin. Of this the furriers make a covering that is warm and durable, though coarse and unsightly. His flesh is very indifferent, and seems to be disliked by all other animals, no other creature being known to eat the wolf's flesh except the wolf himself. He breathes a most fœtid vapour from his jaws, as his food is indiscriminate, often putrid, and seldom cleanly. In short, every way offensive, a savage aspect, a frightful howl, an unsupportable odour, a perverse disposition, fierce habits, he is hateful while living, and useless when dead.

THE FOX.

The Fox very exactly resembles the wolf and the dog internally, and although he differs greatly from both in size and carriage, yet when we come to examine his shapes minutely, there will appear to be very little difference in the description. Were, for instance, a painter to draw from a natural historian's exactest description the figure of a dog, a wolf, and a fox, without having ever seen either, he would be very apt to confound all these animals together; or rather he would be un-

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Brooke's Natural History, vol. i. p. 198.

† Dictionnaire Raisonnee. Loup.

able to catch those peculiar outlines that no description can supply Words will never give any person an exact idea of forms any way irregular; for although they be extremely just and precise, yet the numberless discriminations to be attended to will confound each other, and we shall no more conceive the precise form, than we should be able to tell when one pebble more was added or taken away from a thousand. To conceive, therefore, how the fox differs in form from the wolf or the dog, it is necessary to see all three, or at least to supply the defects of description by examining the difference in a print.

The fox is of a slenderer make than the wolf, and not near so large: for as the former is above three feet and a half long, so the other is not above two feet three inches. The tail of the fox also is longer in proportion and more bushy; its nose is smaller and approaching more nearly to that of the grey-hound, and its hair is softer. On the other hand. it differs from the dog in having its eyes obliquely situated, like those of the wolf; its ears are directed also in the same manner as those of the wolf, and its head is equally large in proportion to its size. It differs still more from the dog in its strong offensive smell, which is peculiar to the species and often the cause of their death. However, some are ignorantly of opinion that it will keep off infectious diseases, and they preserve this animal near their habitations for that very purpose.

The fox has since the beginning been famous for his cunning and his arts, and he partly merits his reputation.* Without attempting to oppose either the dogs or the shepherds, without attacking the flock, or alarming the village, he finds an easier way to subsist, and gains by his address what is denied to his strength or courage. Patient and prudent, he waits the opportunity of depredation, and varies his conduct with every occasion. His whole study is his preservation; although nearly as indefatigable, and actually more swift than the wolf, he does not entirely trust to either, but makes himself an asylum, to which he retires in case of necessity; where he shelters himself from danger, and brings up his young.

As among men, those who lead a domestic life are more civilized and more endued with wisdom than those who wander from place to place; so, in the inferior ranks of animated nature, the taking possession of a home supposes a degree of instinct which others are without.† The choice of the situation for this domicil, the art of making it convenient. of hiding its entrance, and securing it against more powerful animals. are all so many marks of superior skill and industry. The fox is furnished with both, and turns them to his advantage. He generally keeps his kennel at the edge of the wood, and yet within an easy journey of some neighbouring cottage. From thence he listens to the crowing of the cock, and the cackling of the domestic fowls. He scents them at a distance; he seizes his opportunity, conceals his approaches, creeps slily along, makes the attack, and seldom returns without his booty. If he be able to get into the yard, he begins by levelling all the poultry without remorse, and carrying off a part of the spoil, hides it at some convenient distance, and again returns to the charge. Taking off another fowl in the same manner, he hides that also, but not in the same place ; and this he practises for several times together, until the approach of day, or the noise of the domestics give him warning to retire. The same arts are practised when he finds birds entangled in springes laid for them by the fowler ; the fox takes care to be beforehand, very expertly takes the bird out of the snare, hides it for three or four days, and knows very exactly when and where to return to avail himself of the hidden treasure. He is equally alert in seizing young hares and rabbits before they have strength enough to escape him, and when the old ones are wounded and fatigued, he is sure to come upon them in their moments of distress, and to show them no mercy. In the same manner he finds out birds' nests, seizes the partridge and the quail while sitting, and destroys a large quantity of game. The wolf is most hurtful to the peasant, but the fox to the gentleman. In short, nothing that can be eaten seems to come amiss ; rats, mice, serpents, toads, and lizards. He will, when urged by hunger, eat vegetables and insects ; and those that live near the sea-coasts, will, for want of other food, eat crabs, shrimps, and shell-fish. The hedge-hog in vain rolls itself up into a ball to oppose him, this determined glutton teases it until it is obliged to appear uncovered, and then he devours it. The wasp and the wild bee are attacked with equal success. Although at first they fly out upon the invader, and actually oblige him to retire, this is but for a few minutes, until he has rolled himself upon the ground, and thus crushed such as stick to his skin ; he then returns to the charge, and at last, by perseverance, obliges them to abandon their combs ; which he greedily devours, both wax and honey.

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* Buffon, Renard. † Ibid.

The chase of the fox requires less preparation than that of the wolf, and it is also more pleasant and amusing. As dogs have a natural repugnance to pursue the wolf, so they are equally alert in following the fox ; which they prefer even to the chase of the hare or the buck. The huntsmen, as upon other occasions, have their cant terms for every part of this chase. The fox the first year is called *a cub;* the second, *a fox;* and the third an *old fox* ; his tail is called the *brush* or *drag*, and his excrement the *billiting*. He is usually pursued by a large kind of harrier or hound, assisted by terriers, or a smaller breed, that follow him into his kennel, and attack him there. The instant he perceives himself pursued, he makes to his kennel and takes refuge at the bottom of it, where for a while he loses the cry of his enemies ; but the whole pack coming to the mouth, redouble their vehemence and rage, and the little terrier boldly ventures in. It often happens that the kennel is made under a rock, or among the roots of old trees ; and in such cases the fox cannot be dug out, nor is the terrier able to contend with him at the bottom of his hole. By this contrivance he continues secure ; but when he can be dug out, the usual way is to carry him in a bag to some open country, and there set him loose before the hounds. The hounds and the men follow, barking and shouting wherever he runs ; and the body being strongly employed, the mind has not time to make any reflection on the futility of the pursuit. What adds to this entertainment is the strong scent which the fox leaves, that always keeps up a full cry ; although as his scent is stronger than that of the hare, it is much sooner evaporated. His shifts to escape when all retreat is cut off to his kennel, are various and surprising. He always chooses the most woody country and takes those paths that are most embarrassed with thorns and briars. He does not double, nor use the unavailing shifts of the hare; but flies in a direct line before the hounds, though at no very great distance; manages his strength; takes to the low and plashy grounds, where the scent will be less apt to lie; and at last when overtaken, he defends himself with desperate obstinacy, and fights in silence to the very last gasp.

The fox, though resembling the dog in many respects, is nevertheless very distinct in his nature, refusing to engender with it; and though not testifying the antipathy of the wolf, yet discovering nothing more than indifference This animal also brings forth fewer at a time than the dog, and that but once a year. Its litter is generally from four to six and seldom less than three. The female goes with young about six weeks, and seldom stirs out while pregnant, but makes a bed for her young, and takes every precaution to prepare for their production. When she finds the place of their retreat discovered, and that her young have been disturbed during her absence, she removes them one after the other in her mouth, and endeavours to find them out a place of better security. A remarkable instance of this animal's parental affection happened while I was writing this history, in the county of Essex. A she-fox that had, as it should seem, but one cub, was unkennelled by a gentleman's hounds near Chelmsford, and hotly pursued. In such a case, when her own life was in imminent peril, one would think it was not a time to consult the safety of her young; however, the poor animal, braving every danger, rather than leave her cub behind to be worried by the dogs, took it up in her mouth, and ran with it in this manner for some miles. At last, taking her way through a farmer's yard, she was assaulted by a mastiff, and at last obliged to drop her cub, which was taken up by the farmer. I was not displeased to hear that this faithful creature escaped the pursuit, and at last got off in safety. The cubs of the fox are born blind, like those of the dog; they are eighteen months or two years in coming to perfection, and live about twelve or fourteen years.

As the fox makes war upon all animals, so all others seem to make war upon him. The dog hunts him with peculiar acrimony; the wolf is still a greater and more necessitous enemy, who pursues him to his very retreat. Some pretend to say, that, to keep the wolf away, the fox lays at the mouth of its kennel a certain herb, to which the wolf has a particular aversion. This, which no doubt is a fable, at least shows that these two animals are as much enemies to each other, as to all the rest of Animated Nature. But the fox is not hunted by quadrupeds alone; for the birds, who know him for their mortal enemy, attend him in his excursions and give each other warning of their approaching danger. The daw, the magpie, and the blackbird conduct him along, perching on the hedges as he creeps below, and, with their cries and notes of hostility, apprize all other animals to beware; a caution which they perfectly understand, and put into practice. The hunters themselves are often informed by the birds of the place of his retreat, and set the dogs into those thickets where they see them particularly noisy and querulous. So that it is the fate of this petty plunderer to be detested by every rank of animals; all the weaker classes shun and all the stronger pursue him.

The fox, of all wild animals, is most subject to the influence of climate; and there are found as many varieties in this kind almost as in any of the domestic animals.* The generality of foxes, as is well known, are red; but there are some, though not in England, of a grayish cast; and Mr. Buffon asserts, that the tip of the tail in all foxes is white; which, however, is not so in those of this country. There are only three varieties of this animal in Great Britain, and these are rather established upon a difference of size than of colour or form. The greyhound fox, is the largest, tallest, and boldest; and will attack a grown sheep. The mastiff fox is less, but more strongly built. The cur fox is the least and most common; he lurks about hedges and out-houses, and is the most pernicious of the three to the peasant and the farmer.

In the colder countries round the pole, the foxes are of all colours; black, blue, grey, iron grey, silver grey, white, white with red legs, white with black heads, white with the tip of the tail black, red with the throat and belly entirely white, and lastly, with a stripe of black running along the back, and another crossing it at the shoulders.† The common kind, however, is more universally diffused than any of the former, being found in Europe, in the temperate climates of Asia, and also in America; they are very rare in Africa, and in the countries lying under the torrid zone. Those travellers who talk of having seen them at Calicut, and other parts of Southern India, have mistaken the jackal for the fox. The fur of the white fox is held in no great estimation, because the hair falls off. The blue fox skins are bought up with great avidity, from their scarceness; but the black fox skin is of all others the most esteemed, a single skin often selling for forty or fifty crowns. The hair of these is so disposed, that it is impossible to tell which way the grain lies; for if we hold the skin by the head, the hair hangs to the tail; and if we hold it by the tail, it hangs down equally smooth and even to the head. These are often made into men's muffs, and are at once very beautiful and warm. In our temperate climate, however, furs are of very little service, there being scarce any weather so severe in England from which our ordinary clothes may not very well defend us.

THE JACKAL.

The jackal is one of the commonest wild animals in the East; and yet there is scarce any less known in Europe, or more confusedly described by natural historians. In general, however, we are assured that it resembles the fox in figure and disposition, but we are still ignorant of those nice distinctions by which it is known to be of a different species It is said to be of the size of a middling dog, resembling the fox in the hinder parts, particularly the tail; and the wolf in the foreparts, especially the nose. Its legs are shorter than those of the fox, and its colour is of a bright yellow, or sorrel as we express it in horses.

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* Buffon, Renard. † Ibid.

Ichneumon, p. 167.

Jackal, p. 150.

Black Squirrel, p. 188.

Squirrel, p. 187

To face p. 150, vol. ii.

This is the reason it has been called in Latin the *golden wolf*; a name however, which is entirely unknown in the countries where they are most common.

The species of the jackal is diffused all over Asia, and is found also in most parts of Africa, seeming to take up the place of the wolf, which in those countries is not so common. There seem to be many varieties among them; those of the warmest countries appear to be the largest, and their colour is rather of a reddish brown, than of that beautiful yellow by which the smaller jackals are chiefly distinguished.

Although the species of the wolf approaches very near to that of the dog, yet the jackal seems to be placed between them; to the savage fierceness of the wolf, it adds the impudent familiarity of the dog.* Its cry is a howl, mixed with barking, and a lamentation resembling that of human distress. It is more noisy in its pursuits even than the dog, and more voracious than the wolf. The jackal never goes alone, but always in a pack of forty or fifty together.—These unite regularly every day to form a combination against the rest of the forest. Nothing then can escape them; they are content to take up with the smallest animals; and yet, when thus united, they have courage to face the largest. They seem very little afraid of mankind, but pursue their game to the very doors, without testifying either attachment or apprehension. They enter insolently into the sheep-folds, the yards, and the stables, and, when they can find nothing else, devour the leather harness, boots, and shoes, and run off with what they had not time to swallow.

They not only attack the living but the dead. They scratch up with their feet the new-made graves, and devour the corpse how putrid soever. In those countries, therefore, where they abound, they are obliged to beat the earth over the grave, and mix it with thorns to prevent the jackals from scraping it away. They always assist each other as well in this employment of exhumation, as in that of the chase.—While they are at this dreary work, they exhort each other by a most mournful cry, resembling that of children under chastisement and when they have thus dug up the body, they share it amicably between them. These, like all other savage animals, when they have once tasted of human flesh, can never after refrain from pursuing mankind. They watch the burying-grounds, follow armies, and keep in the rear of caravans. They may be considered as the vulture of the quadruped kind; every thing that once had animal life, seems equally agreeable to them; the most putrid substances are greedily devoured; dried leather, and any thing that has been rubbed with grease, how insipid soever in itself, is sufficient to make the whole go down.

They hide themselves in holes by day, and seldom appear abroad till night-fall, when the jackal that has first hit upon the scent of some large beast gives notice to the rest by a howl, which it repeats as it runs; while all the rest that are within hearing, pack in to its assistance. The gazelle, or whatever other beast it may be, finding itself pursued, makes off towards the houses and the towns; hoping, by that means, to deter its pursuers from following: but hunger gives the jackal the same degree of boldness that fear gives the gazelle, and it pursues even to the verge of the city, and often along the streets. The gazelle, however, by this means, most frequently escapes ; for the inhabitants sallying out, often disturb the jackal in the chase ; and as it hunts by the scent, when once driven off, it never recovers it again. In this manner we see how experience prompts the gazelle, which is naturally a very timid animal, and particularly fearful of man, to take refuge near him, considering him as the least dangerous enemy, and often escaping by his assistance.

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* Buffon, vol. xxvii. p. 52.

But man is not the only intruder upon the jackal's industry and pursuits. The lion, the tiger, and the panther, whose appetites are superior to their swiftness, attend to its call, and follow in silence at some distance behind* The jackal pursues the whole night with unceasing assiduity, keeping up the cry, and with great perseverance at last tires down its prey ; but just at the moment it supposes itself going to share the fruits of its labour, the lion or the leopard comes in, satiates himself upon the spoil, and his poor provider must be content with the bare carcass he leaves behind. It is not to be wondered at, therefore, if the jackal be voracious, since it so seldom has a sufficiency ; nor that it feeds on putrid substances, since it is not permitted to feast on what it has newly killed. Besides these enemies, the jackal has another to cope with, for between him and the dog, there is an irreconcileable antipathy ; and they never part without an engagement. The Indian peasants often chase them as we do foxes ; and have learned by experience, when they have got a lion or a tiger in their rear. Upon such occasions they keep their dogs close, as they would be no match for such formidable animals, and endeavour to put them to flight with their cries. When the lion is dismissed, they more easily cope with the jackal, who is as stupid as he is impudent, and seems much better fitted for pursuing than retreating. It sometimes happens that one of them steals silently into an outhouse to seize the poultry, or devour the furniture, but hearing others in full cry, at a distance, without thought, it instantly answers the call, and thus betrays its own depredations.—The peasants sally out upon it, and the foolish animal finds, too late, that its instinct was too powerful for its safety.

THE ISATIS.

As the jackal is a sort of intermediate species between the dog and the wolf,† so the isatis may be considered as placed between the dog and the fox. This animal has hitherto been supposed to be only a variety of the latter ; but from the latest observations, there is no doubt of their being perfectly distinct. The isatis is very common in all the northern countries bordering upon the Icy Sea ; and is seldom found, except in the coldest countries. It extremely resembles a fox, in the form of its body and the length of its tail ; and a dog, in the make of its head, and the position of its eyes. The hair of these animals is softer than that of a common fox ; some are blue, some are white at one season, and at another of a russet brown. Although the whole of its hair be two inches long, thick, tufted, and glossy, yet the under jaw is entirely without any, and the skin appears bare in that part.

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* Linnæi Systema, p. 60.

† In this description I have followed Mr. Buffon.

This animal can bear only the coldest climates, and is chiefly seen along the coasts of the Icy Sea, and upon the banks of the great rivers that discharge themselves therein. It is chiefly fond of living in the open country, and seldom seen in the forest, being mostly found in the mountainous and naked regions of Norway, Siberia, and Lapland. It burrows like the fox; and, when with young, the female retires to her kennel, in the same manner as the fox is seen to do. These holes, which are very narrow, and extremely deep, have many outlets.—They are kept very clean, and are bedded at the bottom with moss, for the animal to be more at its ease. Its manner of coupling, time of gestation, and number of young, are all similar to what is found in the fox : and it usually brings forth at the end of May or the beginning of June.

Such are the particulars in which this animal differs from those of the dog kind, and in which it resembles them : but its most striking peculiarity remains still to be mentioned; namely, its changing its colour, and being seen at one time brown, and at another perfectly white. As was already said, some are naturally blue, and their colour never changes ; but such as are to be white, are, when brought forth, of a yellow hue, which, in the beginning of September, is changed to white, all except along the top of the back, along which runs a stripe of brown, and another crossing it down the shoulders, at which time, the animal is called the *crossed fox* ; however, this brown cross totally disappears before winter, and then the creature is all over white, and its fur is two inches long : this, about the middle of May begins to fall ; and the moulting is completed about the middle of July, when the isatis becomes brown once more. The fur of this animal is of no value, unless it be killed in winter.

THE HYÆNA.

The hyæna is the last animal I shall mention among those of the dog kind, which it, in many respects, resembles, although too strongly marked to be strictly reduced to any type. The hyæna is nearly of the size of a wolf; and has some similitude to that animal in the shape of its head and body. The head, at first sight, does not appear to differ, except that the ears of the hyæna are longer, and more without hair; but, upon observing more closely, we shall find the head broader the nose flatter, and not so pointed. The eyes are not placed obliquely, but more like those of a dog. The legs, particularly the hinder, are longer than those either of the dog or the wolf, and different from all other quadrupeds, in having but four toes, as well on the fore-feet as on the hinder. Its hair is of a dirty grayish, marked with black, disposed in waves down its body. Its tail is short, with pretty long hair ; and immediately under it, above the anus, there is an opening into a kind of glandular pouch, which separates a substance of the consistence, but not of the odour, of civet. This opening might have given rise to the error of the ancients, who asserted, that this animal was every year alternately male and female. Such are the most striking distinctions of the hyæna, as given us by naturalists; which, nevertheless, convey but a very confused idea of the peculiarity of its form. Its manner of holding the head seems remarkable; somewhat like a dog, pursuing the scent, with the nose near the ground. The head being held thus low, the back appears elevated, like that of the hog, which, with a long bristly band of hair that runs all along, gives it a good deal the air of that animal; and, it is probable, that from this similitude it first took its name; the word *huaina* being Greek, and derived from *hus* which signifies a *sow*.

But no words can give an adequate idea of this animal's figure, deformity, and fierceness , more savage and untameable than any other quadruped, it seems to be for ever in a state of rage or rapacity, for ever growling except when receiving its food. Its eyes then glisten, the bristles of its back all stand upright, its head hangs low, and yet its teeth appear; all which gives it a most frightful aspect, which a dreadful howl tends to heighten. This, which I have often heard, is very peculiar: its beginning resembles the voice of a man moaning, and its latter part as if he were making a violent effort to vomit. As it is loud and frequent, it might, perhaps, have been sometimes mistaken for that of a human voice in distress, and have given rise to the accounts of the ancients, who tell us that the hyæna makes its moan to attract unwary travellers, and then destroy them: however this be, it seems the most untractable, and, for its size the most terrible of all other quadrupeds; nor does its courage fall short of its ferocity; it defends itself against the lion, is a match for the panther, attacks the ounce, and seldom fails to conquer.

It is an obscene and solitary animal, to be found chiefly in the most desolate and uncultivated parts of the torrid zone, of which it is a native.* It resides in the caverns of mountains, in the clefts of rocks, or in dens that it has formed for itself under the earth. Though taken never so young, it cannot be tamed; it lives by depredation, like the wolf, but is much stronger and more courageous.—It sometimes attacks man, carries off cattle, follows the flock, breaks open the sheep-cots by night, and ravages with insatiable voracity. Its eyes shine by night; and it is asserted, not without great appearance of truth, that it sees better by night than by day. When destitute of other provision, it scrapes up the graves, and devours the dead bodies how putrid soever. To these dispositions, which are sufficiently noxious and formidable, the ancients have added numberless others, which are long since known to be fables, as, for instance, that the hyæna was male and female alternately; that having brought forth and suckled its young, it then changed sexes for a year, and became a male. This, as was mentioned above, could only proceed from the opening under the tail, which all animals of this species are found to have; and which is found in the same manner in no other quadruped, except the badger. There is, in the weasel kind indeed, an opening, but it is lower down, and not

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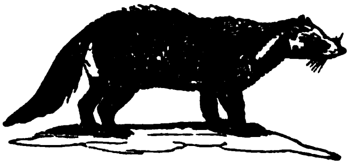
* Buffon.



Genet, p. 168.

Civet, p. 170.

Grey Squirrel, p. 190.

To face p. 155, vol. ii.

placed above the anus, as in the badger and the hyæna. Some have said that this animal changes the colour of its hair at will; others, that a stone was found in its eye, which, put under a man's tongue, gave him the gift of prophecy; some have said that it had no joints in the neck, which, however, all quadrupeds are known to have; and some, that the shadow of the hyæna kept dogs from barking. These among many other absurdities, have been asserted of this quadruped; and which I mention to show the natural disposition of mankind, to load those that are already but too guilty with accumulated reproach.

CHAPTER III.

OF ANIMALS OF THE WEASEL KIND.

HAVING described the bolder ranks of carnivorous animals, we now come to a minuter and more feeble class, less formidable indeed than any of the former, but far more numerous, and in proportion to their size, more active and enterprising. The weasel kind may be particularly distinguished from other carnivorous animals, by the length and slenderness of their bodies, which are so fitted as to wind, like worms, into very small openings, after their prey; and hence also they have received the name of vermin, from their similitude to the worm in this particular. These animals differ from all the cat kind, in the formation and disposition of their claws, which, as in the dog kinds, they can neither draw nor extend at pleasure, as cats are known to do. They differ from the dog kind, in being clothed rather with fur than hair; and although some varieties of the fox may resemble them in this particular, yet the coat of the latter is longer, stronger, and alwa more resembling hair. Besides these distinctions, all animals of the weasel kind have glands placed near the anus, that either open into or beneath it, furnishing a substance that, in some, has the most offensive smell in nature, in others, the most pleasing perfume. All of this kind are still more marked by their habitudes and dispositions, than their external form; cruel, voracious, and cowardly, they subsist only by theft, and find their chief protection in their minuteness. They are all, from the shortness of their legs, slow in pursuit; and, therefore, owe their support to their patience, assiduity, and cunning. As their prey is precarious they live a long time without food; and if they happen to fall in where it is in plenty, they instantly destroy all about them before they begin to satisfy their appetite, and suck the blood of every animal before they begin to touch its flesh.

These are the marks common to this kind, all the species of which have a most striking resemblance to each other; and he that has seen one, in some measure may be said to have seen all. The chief distinction in this numerous class of animals, is to be taken from the size; for no words can give the minute irregularities of that outline by which one species is said to be distinguished from that which is next it. I will begin, therefore with the least and the best known of this kind, and still marking the size, will proceed gradually to larger and larger, until we come from the weasel to the glutton, which I take to be the largest of all. The weasel will serve as a model for all the rest; and, indeed, the points in which they differ from this little animal, are but very inconsiderable.

The WEASEL,* as was said, is the smallest of this numerous tribe; its length not exceeding seven inches, from the tip of the nose to the insertion of the tail, This length, however, seems to be very great if we compare it with the height of the animal, which is not above an inch and a half. In measuring the wolf, we find him to be not above once and a half as long as he is high; in observing the weasel, we find it near five times as long as it is high, which shows an amazing disproportion. The tail also, which is bushy, is two inches and a half long, and adds to the apparent length of this little animal's body. The colour of the weasel is of a bright red on the back and sides, but white under the throat and the belly. It has whiskers like a cat; and thirty-two teeth, which is two more than any of the cat kind; and these also seem better adapted for tearing and chewing, than those of the cat kind are. The eyes are little and black. The ears short, broad and roundish; and have a fold at the lower part, which makes them look as if they were double. Beneath the corners of the mouth, on each jaw, is a spot of brown.

This animal though very diminutive to appearance, is, nevertheless, a very formidable enemy to quadrupeds an hundred times its own size. It is very common and well known in most parts of this country; but seems held in very different estimation in different parts of it. In those places where sheep or lambs are bred, the weasel is a most noxious inmate, and every art is used to destroy it; on the contrary, in places where agriculture is chiefly followed, the weasel is considered as a friend that thins the number of such vermin as chiefly live upon corn: however, in all places, it is one of the most untameable and untractable animals in the world.† When kept in a cage either for the purpose of amusement or inspection, it will not touch any part of its victuals while any body looks on. It keeps in a continual agitation, and seems frighted so much at the sight of mankind, that it will die, if not permitted to hide itself from their presence. For this purpose, it must be provided, in its cage,with a sufficient quantity of wool or hay, in which it may conceal itself, and where it may carry whatever it has got to eat; which however it will not touch till it begins to putrefy. In this state it is seen to pass three parts of the day in sleeping; and reserves the night for its times of exercise and eating.

In its wild state, the night is likewise the time during which it may be properly said to live. At the approach of evening, it is seen stealing from its hole, and creeping about the farmer's yard for its prey. If it enters the place where poultry are kept, it never attacks the cocks or the old hens, but immediately aims at the young ones. It does not eat its prey on the place, but, after killing it by a single bite near the head, and with a wound so small that it can scarcely be perceived, it carries it off to its young, or its retreat. It also breaks, and sucks the eggs, and sometimes kills the hen, that attempts to defend them. It is remarkably active; and, in a confined place, scarce any animal can escape it It will run up the sides of walls with such facility, that no place is secure from it; and its body is so small, that there is scarce any hole but what it can wind through. During the summer, its excursions are more extensive; but in winter, it chiefly confines itself in barns and farm-yards, where it remains till spring, and where it brings forth its young. All this season it makes war upon the rats and mice, with still greater success than the cat; for being more active and slender, it pursues them into their holes, and, after a short resistance, destroys them. It creeps also into pigeon-holes, destroys the young, catches sparrows, and all kinds of small birds; and, if it has brought forth its young, hunts with still greater boldness and avidity. In summer, it ventures farther from the house; and particularly goes into those places where the rat, its chiefest prey, goes before it. Accordingly, it is found in the lower grounds, by the side of waters, near mills, and often is seen to hide its young in the hollow of a tree.

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* British Zoology, vol. i. p. 83.

† Buffon, vol. xv p. 37.

The female takes every precaution to make an easy bed for her little ones' she lines the bottom of her hole with grass, hay, leaves, and moss, and generally brings forth from three to five at a time. All animals of this, as well as those of the dog kind, bring forth their young with closed eyes: but they very soon acquire strength sufficient to follow the dam in her excursions, and assist in her projects of petty rapine. The weasel, like all others of its kind, does not run on equably, but moves by bounding; and when it climbs a tree, by a single spring it gets a good way from the ground. It jumps in the same manner upon its prey; and, having an extremely limber body, evades the attempts of much stronger animals to seize it.

This animal, like all of its kind, has a very strong smell; and that of the weasel is particularly fœtid. This scent is very distinguishable in those creatures, when they void their excrement; for the glands which furnish this fœtid substance, which is of the consistence of suet, open directly into the orifice of the anus, and taint the excrements with the strong effluvia. The weasel smells more strongly in summer than in winter; and more abominably when irritated or pursued, than when at its ease. It always preys in silence, and never has a cry except when struck, and then it has a rough kind of squeaking, which at once expresses resentment and pain. Its appetite for animal food never forsakes it; and it seems even to take a pleasure in the vicinity of putrefaction. Mr. Buffon tells us of one of them being found, with three young ones, in the carcass of a wolf that was grown putrid, and that had been hung up, by the hind legs, as a terror to others. Intc this horrid retreat the weasel thought proper to retire to bring forth her young; she had furnished the cavity with hay, grass, and leaves; and the young were just brought forth when they were discovered by a peasant passing that way.

THE ERMINE, OR STOAT.

Next to the weasel in size, and perfectly alike in figure, is the ermine. The difference between this and the former animal is so very small that many, and among the rest Linnæus, who gives but one description of both, have confounded the two kinds together. However, their differences are sufficient to induce later naturalists to suppose the two kinds distinct; and as their lights seem preferable, we choose to follow their descriptions.*

The stoat, or ermine, differs from the weasel in size, being usually nine inches long; whereas the former is not much above six. The tail of the ermine is always tipped with black, and is longer in proportion to the body, and furnished with hair. The edges of the ears and the ends of the toes in this animal are of a yellowish white; and although it is of the same colour with the weasel, being of a lightish brown, and though both this animal, as well as the weasel, in the most northern parts of Europe, changes its colour in winter, and becomes white, yet even then the weasel may be easily distinguished from the ermine by the tip of the tail, which in the latter is always black.

It is well known that the fur of the ermine is the most valuable of any hitherto known; and it is in winter only that this little animal has it of the proper colour and consistence. In summer, the ermine, as was said before, is brown, and it may at that time more properly be called the *stoat*. There are few so unacquainted with quadrupeds as not to perceive this change of colour in the hair, which in some degree obtains in them all. The horse, the cow, and the goat, all manifestly change colour in the beginning of summer, the old long hair falling off and a shorter coat appearing in its room, generally of a darker colour, and yet more glossy. What obtains in our temperate climate, is seen to prevail still more strongly in those regions where the winters are long and severe, and the summers short and generally hot in an extreme degree. The animal has strength enough during that season to throw off a warm coat of fur, which would but incommode it, and continues for two or three months in a state somewhat resembling the ordinary quadrupeds of the milder climates. At the approach of winter, however, the cold increasing, the coat of hair seems to thicken in proportion; from being coarse and short, it lengthens and grows finer, while multitudes of smaller hairs grow up between the longer, thicken the coat, and give it all that warmth and softness which are so much valued in the furs of the northern animals.

It is no easy matter to account for this remarkable warmth of the furs of northern quadrupeds, or how they come to be furnished with such an abundant covering. It is easy enough indeed, to say, that Nature fits them thus for the climate; and like an indulgent mother, when she exposes them to the rigour of an intemperate winter, supplies them with a covering against its inclemency, But this is only flourishing: it is not easy, I say, to tell how Nature comes to furnish them in this man-

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* Buffon British Zoology.

Genet, p. 171.

Polecat, p. 162.

Glutton, p. 174.

Otter, p. 214.

To face p. 158, vol. ii.

ner. A few particulars on this subject are all that we yet know. It is observable among quadrupeds, as well as even among the human species itself, that a thin sparing diet is apt to produce hair; children that have been ill fed, famished dogs and horses, are more hairy than others whose food has been more plentiful. This may, therefore, be one cause that the animals of the north, in winter, are more hairy than those of the milder climates. At that season, the whole country is covered with a deep snow, and the provisions which these creatures are able to procure can be but precarious and scanty. Its becoming finer may also proceed from the severity of the cold, that contracts the pores of the skin, and the hair consequently takes the shape of the aperture through which it grows, as wires are made smaller by being drawn through a smaller orifice. However this may be, all the animals of the arctic climates may be said to have their winter and summer garments, except very far to the north, as in Greenland, where the cold is so continually intense and the food so scarce, that neither the bears nor foxes change colour.*

The ermine, as was said, is remarkable among these for the softness the closeness, and the warmth of its fur. It is brown in summer, like the weasel, and changes colour before the winter is begun, becoming a beautiful cream colour, all except the tip of the tail, as was said before, which still continues black. Mr. Daubenton had one of these brought him with its white winter fur, which he put into a cage and kept, in order to observe the manner of moulting its hair. He received it in the beginning of March; in a very short time it began to shed its coat, and a mixture of brown was seen to prevail among the white, so that at the ninth of the same month its head was nearly become of a reddish brown. Day after day this colour appeared to extend, at first along the neck and down the back, in the manner of a stripe of about half an inch broad. The fore-part of the legs then assumed the same colour; a part of the head, the thighs, and the tail, were the last that changed; but at the end of the month there was no white remaining, except on those parts which are always white, in this species particularly, the throat and the belly. However he had not the pleasure of seeing this animal resume its former whiteness although he kept it for above two years; which, without doubt, was owing to its imprisoned state; this colour being partly owing to its stinted food, and partly to the rigour of the season. During its state of confinement this little animal always continued very wild and untractable; for ever in a state of violent agitation, except when asleep, which it often continued for three parts of the day. Except for its most disagreeable scent, it was a pretty creature, it eyes sprightly, its phisiognomy pleasant, and its motions so swift that the eye could scarce attend them. It was fed with eggs and flesh, but it always let them putrefy before it touched either. As some of this kind are known to be fond of honey, it was tried to feed this animal with such food for a while; after having for three or four days deprived it of other food, it ate of this, and died shortly after; a strong proof of its being a distinct species from the pole-cat or the martin, who feed upon honey, but otherwise pretty much resemble the ermine in their figure and dispositions.

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* Krantz's History of Greenland, vol. i p. 72.

In the north of Europe and Siberia their skins make a valuable article of commerce, and they are found there much more frequently than among us. In Siberia they burrow in the fields, and are taken in traps baited with flesh. In Norway they are either shot with blunt arrows, or taken in traps made of two flat stones, one being propped with a stick, to which is fastened a baited string, and when the animals attempt to pull this away, the stone drops and crushes them to death. This animal is sometimes found white in Great Britain, and is then called a white weasel. Its furs, however, among us are of no value, having neither the thickness, the closeness, nor the whiteness of those which come from Siberia. The fur of the ermine, in every country, changes by time; for, as much of its beautiful whiteness is given it by certain arts known to the furriers, so its natural colour returns, and its former whiteness can never be restored again.

THE FERRET.

The animal next in size to the ermine, is the ferret; which is a kind of domestic in Europe, though said to be originally brought from Africa into Spain, which being a country abounding in rabbits, required an animal of this kind, more than any other: however this be, it is not to be found at present among us, except in itsdomestic state; and it is chiefly kept tame, for the purposes of the warren.

The ferret is about one foot long, being nearly four inches longer than the weasel. It resembles that animal in the slenderness of its body, and the shortness of its legs; but its nose is sharper, and its body more slender, in proportion to its length. The ferret is commonly of a cream colour; but they are also found of all the colours of the weasel kind; while, blackish, brown, and party-coloured. Those that are of the whitish kind, have their eyes red, as is almost general with all animals entirely of that colour. But its principal distinction from the weasel is the length of the hair on its tail, which is much longer in the ferret than the weasel. Words will not well express the other distinctions; and what might take up a page in dull discrimination, a single glance of the eye, when the animals themselves are presented, can discover.

As this animal is a native of the torrid zone,* so it cannot bear the rigours of our climate without care and shelter; and it generally repays the trouble of its keeping by its great agility in the warren. It is naturally such an enemy of the rabbit kind, that if a dead rabbit be presented to a young ferret, although it has never seen one before, it instantly attacks and bites it with an appearance of rapacity. If the rabbit be living, the ferret is still more eager, seizes it by the neck, winds itself round it, and continues to suck its blood, till it be satiated.

Their chief use in warrens is to enter the holes, and drive the rabbits into the nets that are prepared for them at the mouth. For this purpose the ferret is muzzled; otherwise, instead of driving out the rabbit, it would content itself with killing and sucking its blood at the bottom of the hole; but, by this contrivance, being rendered unable to seize its prey, the rabbit escapes from its claws, and instantly makes to the mouth of the hole with such precipitation, that it is inextricably entangled in the net, placed there for its reception. It often happens, however, that the ferret disengages itself of its muzzle, and then it is most commonly lost, unless it be dug out; for, finding all its wants satisfied in the warren, it never thinks of returning to the owner, but continues to lead a rapacious solitary life while the summer continues, and dies with the cold of the winter. In order to bring the ferret from his hole, the owners often burn straw and other substances at the mouth; they also beat above to terrify it; but this does not always succeed; for as there are often several issues to each hole, the ferret is affected neither by the noise nor the smoke, but continues secure at the bottom, sleeping the greatest part of the time, and waking only to satisfy the calls of hunger.

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* Buffon.

The female* of this species is sensibly less than the male, whom she seeks with great ardour, and, it is said, often dies without being admitted. They are usually kept in boxes, with wool, of which they make themselves a warm bed, that serves to defend them from the rigour of the climate. They sleep almost continually; and the instant they awake, they seem eager for food. They are usually fed with bread and milk. They breed twice a year. Some of them devour their young as soon as brought forth, and then become fit for the male again. Their number is usually from five to six at a litter; and this is said to consist of more females than males. Upon the whole, this is an useful, but a disagreeable and offensive animal; its scent is fœtid, its nature voracious, it is tame without any attachment, and such is its appetite for blood, that it has been known to attack and kill children in the cradle. It is very easy to be irritated; and, although at all times its smell is very offensive, it then is much more so; and its bite is very difficult to cure.

To the ferret kind we may add an animal which Mr. Buffon calls the *vansire*, the skin of which was sent him stuffed from Madagascar. It was thirteen inches long, a good deal resembling the ferret in figure, but differing in the number of its grinding teeth, which amounted to twelve; whereas in the ferret there are but eight; it differed also in colour, being of a dark brown, and exactly the same on all parts of its body. Of this animal, so nearly resembling the ferret, we have no other history but the mere description of its figure; and in a quadruped whose kind is so strongly marked, perhaps this is sufficient to satisfy curiosity.

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* Buffon.

THE POLECAT

The Polecat is larger than the weasel, the ermine, or the ferret, being one foot five inches long; whereas, the weasel is but six inches, the ermine nine, and the ferret eleven inches. It so much resembles the ferret in form, that some have been of opinion they were one and the same animal; nevertheless, there are a sufficient number of distinctions between them: it is, in the first place, larger than the ferret; it is not quite so slender, and has a blunter nose; it differs also internally, having but fourteen ribs, whereas the ferret has fifteen; and wants one of the breast bones which is found in the ferret: however, warreners assert, that the polecat will mix with the ferret; and they are sometimes obliged to procure an intercourse between these two animals, to improve the breed of the latter, which by long confinement, is sometimes seen to abate of its rapacious disposition. Mr. Buffon denies that the ferret will admit the polecat; yet gives a variety, under the name of both animals, which may very probably be a spurious race between the two.

However this be, the polecat seems by much the more pleasing animal of the two; for although the long slender shape of all these vermin tribes gives them a very disagreeable appearance, yet the softness and colour of the hair in some of them atones for the defect, and renders them, if not pretty, at least not frightful. The polecat, for the most part, is of a deep chocolate colour; it is white about the mouth, the ears are short, rounded, and tipped with white; a little beyond the corners of the mouth a stripe begins, which runs backward, partly white and partly yellow: its hair, like that of all this class, is of two sorts, the long and the furry; but in this animal the two kinds are of different colours; the longest is black, and the shorter is yellowish:[*] the throat, feet, and tail, are blacker than any other parts of the body; the claws are white underneath, and brown above; and its tail is about two inches and a half.

It is very destructive to young game of all kinds;[†] but the rabbit seems to be its favourite prey; a single polecat is often sufficient to destroy a whole warren; for, with that insatiable thirst for blood which is natural to all the weasel kind, it kills much more than it can devour; and I have seen twenty rabbits at a time taken out dead, which they had destroyed, and that by a wound which was hardly perceptible. Their size, however, which is so much larger than the weasel, renders their retreats near houses much more precarious; although I have seen them burrow near a village, so as scarcely to be extirpated. But, in general, they reside in woods or thick brakes, making holes under ground of about two yards deep, commonly ending among the roots of large trees, for greater security. In winter they frequent houses and make a common practice of robbing the hen-roost, and the dairy.

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[*] Ray's Synopsis.

British Zoology. vol. i. p. 78

The polecat is particularly destructive among pigeons,* when it gets into a dove-house; without making so much noise as the weasel, it does a great deal more mischief; it dispatches each with a single wound in the head; and, after killing a great number, and satisfying itself with their blood, it then begins to think of carrying them home. This it carefully performs, going and returning, and bringing them one by one to its hole; but if it should happen that the opening by which it got into the dove-house be not large enough for the body of the pigeon to get through, this mischievous creature contents itself with carrying away the heads, and makes a most delicious feast upon the brains.

It is not less fond of honey; attacking the hives in winter, and forcing the bees away. It does not remove far from houses in winter, as its prey is not so easily found in the woods during that season. The female brings forth her young in summer, to the number of five or six at a time; these she soon trains to her own rapacious habits, supplying the want of milk, which no carnivorous quadruped has in plenty, with the blood of such animals as she happens to seize. The fur of this animal is considered as soft and warm; yet it is in less estimation than some of a much inferior kind, from its offensive smell, which can never be wholly removed, or suppressed. The polecat seems to be an inhabitant of the temperate climates,† scarce any being found towards the north, and but very few in the warmer latitudes. The species appear to be confined in Europe, from Poland to Italy. It is certain, that these animals are afraid of the cold, as they are often seen to come into houses in winter, and as their tracks are never found in the snow, near their retreats. It is probable, also, that they are afraid of heat, as they are but thinly scattered in the southern climates.

THE MARTIN.

The Martin is a larger animal than any of the former, being generally eighteen inches long, and the tail ten more. It differs from the polecat, in being about four or five inches longer; its tail also is longer in proportion, and more bushy at the end; its nose is flatter; its cry is sharper and more piercing; its colours are more elegant; and, what still adds to their beauty, its scent is very unlike the former, instead of being offensive, is considered as a most pleasing perfume. The martin, in short, is the most beautiful of all British beasts of prey; its head is small, and elegantly formed; its eyes lively; its ears are broad, rounded, and open; its back, its sides, and tail, are covered with a fine thick downy fur, with longer hair intermixed; the roots are ash colour, the middle of a bright chesnut, the points black; the head is brown, with a slight cast of red; the legs, and upper sides of the feet, are of a chocolate colour; the palms, or under sides, are covered with a thick down, like that of the body; the feet are broad, the claws white, large, and sharp, well adapted for the purposes of climbing, but as in others of the weasel kind, incapable of being sheathed or unsheathed at pleasure ; the throat and breast are white ; the belly of the same colour with the back, but rather paler ; the hair on the tail is very long, especially at the end, where it appears much thicker than near the insertion.

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* Buffon. † Ibid.

There is also a variety of this animal, called the *yellow-breasted martin*, which in no respect differs from the former, except that this has a yellow breast, whereas the other has a white one : the colour of the body also is darker ; and, as it lives more among trees than the other martin, its fur is more valuable, beautiful, and glossy. The former of these Mr. Buffon calls the *fouine ;* the latter, simply the *martin* ; and he supposes them to be a distinct species ; but as they differ only in colour, it is unnecessary to embarrass history by a new distinction, where there is only so minute a difference.

Of all animals of the weasel kind, the martin is the most pleasing; all its motions show great grace, as well as agility ; and there is scarce an animal in our woods that will venture to oppose it. Quadrupeds five times as big, are easily vanquished ; the hare, the sheep, and even the wild cat itself, though much stronger, is not a match for the martin ; and although carnivorous animals are not fond of engaging each other, yet the wild cat and the martin seldom meet without a combat. Gesner tells us of one of this kind that he kept tame, which was extremely playful and pretty ; it went among the houses of the neighbourhood, and always returned home when hungry : it was extremely fond of a dog that had been bred up with it, and used to play with it as cats are seen to play, lying on its back, and biting without anger or injury. That which was kept tame by Mr. Buffon, was not quite so social : it was divested of its ferocity, but continued without attachment ; and was still so wild as to be obliged to be held by a chain. Whenever a cat appeared, it prepared for war , and if any of the poultry came within its reach, it flew upon them with avidity.— Though it was tied by the middle of the body, it frequently escaped : at first it returned after some hours, but without seeming pleased, as if it only came to be fed ; the next time it continued abroad longer ; and at last, went away without ever returning. It was a female, and was, when it went off, a year and a half old ; and Mr. Buffon supposes it to have gone in quest of the male. It ate every thing that was given it, except sallad or herbs ; and it was remarkably fond of honey. It was remarked that it drank often, and often slept for two days together ; and that, in like manner, it was often two or three days without sleeping. Before it went to sleep, it drew itself up into a round, hid its head, and covered it with its tail. When awake it was in continual agitation, and was obliged to be tied up, not less to prevent its attacking the poultry, than to hinder it from breaking whatever it came near, by the capricious wildness of its motions.

The yellow-breasted martin is much more common in France than in England ; and yet even there this variety is much scarcer than that with the white breast. The latter keeps nearer houses and villages to make its petty ravages among the sheep and the poultry ; the other keeps in the woods, and leads in every respect a savage life, building its nest on the tops of trees, and living upon such animals as are entirely wild like itself About night-fall it usually quits its solitude to seek its prey, hunts after squirrels, rats, and rabbits; destroys great numbers of birds and their young, takes the eggs from the nest, and often removes them to its own, without breaking.* The instant the martin finds itself pursued by dogs, for which purpose there is a peculiar breed, that seem fit for this chase only, it immediately makes to its retreat, which is generally in the hollow of some tree, towards the top, and which it is impossible to come at without cutting it down. Their nest is generally the original tenement of the squirrel, which that little animal bestowed great pains in completing; but the martin having killed and dispossessed the little architect, takes possession of it for its own use, enlarges its dimensions, improves the softness of the bed, and in that retreat brings forth its young. Its litter is never above three or four at a time; they are brought forth with the eyes closed, as in all the rest of this kind, and very soon come to a state of perfection. The dam compensates for her own deficiency of milk, by bringing them eggs and live birds, accustoming them from the beginning to a life of carnage and rapine. When she leads them from the nest into the woods, the birds at once distinguish their enemies, and attend them, as we before observed of the fox, with all the marks of alarm and animosity.—Wherever the martin conducts her young, a flock of small birds are seen threatening and insulting her, alarming every thicket, and often directing the hunter in his pursuit. The martin is more common in North America than in any part of Europe. These animals are found in all the northern part of the world, from Siberia to China and Canada. In every country they are hunted for their furs, which are very valuable, and chiefly so when taken in the beginning of winter. The most esteemed parts of the martin's skin is that part of it which is browner than the rest, and stretches along the back-bone.—Above twelve thousand of these skins are annually imported into England from Hudson's Bay, and above thirty thousand from Canada.

THE SABLE.

Most of the classes of the weasel kind would have continued utterly unknown and disregarded, were it not for their furs, which are finer, more glossy, and soft, than those of any other quadruped. Their dispositions are fierce and untameable; their scent generally offensive; and their figure disproportioned and unpleasing. The knowledge of one or two of them would, therefore, have sufficed curiosity; and the rest would probably have been confounded together under one common name, as things useless and uninteresting, had not their skins been coveted by the vain, and considered as capable of adding to human magnificence or beauty.

Of all these, however, the skin of the sable is the most coveted, and held in the highest esteem. It is of a brownish black; and the darker it is, it becomes the more valuable.—A single skin, though not above four inches broad, is often valued at ten or fifteen pounds;† the fur differing from others in this, that it has no grain; so that rub it which way you will, it is equally smooth and unresisting. Nevertheless, though this little animal's robe was so much coveted by the great, its history til of late was but very little known; and we are obliged to Mr. Jonelin for the first accurate description of its form and nature.* From him we learn that the sable resembles the martin in form and size, and the weasel in the number of its teeth; for it is to be observed, that whereas the martin has thirty eight teeth the weasel has but thirty-four; in this respect, therefore, the sable seems to make the shade between these two animals; being shaped like the one, and furnished with teeth like the other. It is also furnished with very large whiskers about the mouth; its feet are broad, and, as in the rest of its kind, furnished with five claws on each foot. These are its constant marks; but its fur, for which it is so much valued, is not always the same. Some of these species are of a dark brown over all the body, except the ears and the throat, where the hair is rather yellow; others are more of a yellowish tincture, their ears and throat being also much paler. These, in both, are the colours they have in winter, and which they are seen to change in the beginning of the spring; the former becoming of a yellow brown, and the latter of a pale yellow. In other respects they resemble their kind, in vivacity, agility, and inquietude; in sleeping by day, and seeking their prey by night; in living upon smaller animals, and the disagreeable odour that chiefly characterizes their race.

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* Brooke's Natural History.

† Regnard.

They generally inhabit along the banks of rivers, in shady places, and in the thickest woods. They leap with great ease from tree to tree, and are said to be afraid of the sun, which tarnishes the lustre of their robes. They are chiefly hunted in winter for their skins, during which part of the year they are only in season. They are mostly found in Siberia, and but very few in any other country of the world; and this scarcity it is which enhances their value. The hunting of the sable chiefly falls to the lot of the condemned criminals, who are sent from Russia into these wild and extensive forests, that, for the greatest part of the year, are covered with snow; and, in this instance, as in many others, the luxuries and ornaments of the vain, are wrought out of the dangers and miseries of the wretched. These are obliged to furnish a certain number of skins every year, and are punished if the proper quantity be not provided.

The sable is also killed by the Russian soldiers, who are sent into those parts to that end. They are taxed a certain number of skins yearly, like the former, and are obliged to shoot with only a single ball, to avoid spoiling the skin, or else with a cross-bow, and blunt arrows. As an encouragement to the hunters, they are allowed to share among themselves the surplus of those skins which they thus procure; and this, in the process of six or seven years, amounts to a very considerable sum. A colonel, during his seven years' stay, gains about four thousand crowns for his share, and the common men six or seven hundred each for theirs.

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* Buffon, vol. xxvii. p. 113.

THE ICHNEUMON.

The Ichneumon, which some have injudiciously denominated the *cat of Pharaoh*, is one of the boldest and most useful animals of all the weasel kind. In the kingdom of Egypt, where it is chiefly bred, it is used for the same purposes that cats are in Europe, and is even more serviceable, as being more expert in catching mice than they. This animal is usually of the size of the martin, and greatly resembles it in appearance, except that the hair, which is of a grisly black, is much rougher, and less downy. The tail, also, is not so bushy at the end; and each hair in particular has three or four colours, which are seen in different dispositions of its body. Under its rougher hairs there is a softer fur of a brownish colour, the rough hair being about two inches long, but that of the muzzle extremely short, as likewise that on the legs and paws. However, being long since brought into a domestic state, there are many varieties in this animal; some being much larger than the martin, others much less; some being of a lighter mixture of colours, and some being streaked in the manner of a cat.

The ichneumon, with all the strength of a cat, has more instinct and agility; a more universal appetite for carnage, and a greater variety of powers to procure it.* Rats, mice, birds, serpents, lizards and insects, are all equally pursued; it attacks every living thing which it is able to overcome, and indiscriminately preys on flesh of all kinds. Its courage is equal to the vehemence of its appetites. It fears neither the force of the dog, nor the insidious malice of the cat; neither the claws of the vulture, nor the poison of the viper. It makes war upon all kinds of serpents with great avidity, seizes and kills them, how venomous soever they be; and we are told that when it begins to perceive the effects of their rage, it has recourse to a certain root, which the Indians call after its name, and assert to be an antidote for the bite of the asp or the viper.

But what this animal is particularly serviceable to the Egyptians for, is, that it discovers and destroys the eggs of the crocodile. It also kills the young ones that have not as yet been able to reach the water; and, as fable usually goes hand in hand with truth, it is said that the ichneumon sometimes enters the mouth of the crocodile, when it is found sleeping on the shore, boldly attacks the enemy in the inside, and at length, when it has effectually destroyed it, it eats its way out again.

The ichneumon, when wild, generally resides along the banks of rivers; and in times of inundation makes to the higher ground, often approaching inhabited places in quest of prey. It goes forward silently and cautiously, changing its manner of moving according to its necessities. Sometimes it carries the head high, shortens its body, and raises itself upon its legs; sometimes it lengthens itself and seems to creep along the ground; it is often observed to sit upon its hind legs, like a dog when taught to beg ; but more commonly it is seen to dart like an arrow upon its prey, and seize it with inevitable certainty. Its eyes are sprightly and full of fire, its physiognomy sensible, its body nimble, its tail long, and its hair rough and various. Like all of its kind, it has glands that open behind and furnish an odorous substance. Its nose is too sharp and its mouth too small to permit its squeezing things that are large ; however, it makes up by its courage and activity its want of arms ; it easily strangles a cat though stronger and larger than itself ; and often fights with dogs, which, though never so bold, learn to dread the ichneumon as a formidable enemy. It also takes the water like the otter, and, as we are told, will continue under it much longer.

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* The rest of this description is extracted from Mr. Buffon, except where marked with commas.

This animal grows fast and dies soon. It is found in great numbers in all the southern parts of Asia, from Egypt to Java ; and it is also found in Africa, particularly at the Cape of Good Hope. It is domestic, as was said, in Egypt, but in our colder climate, it is not easy to breed or maintain them, as they are not able to support the rigour of our winters. Nevertheless they take every precaution that instinct can dictate to keep themselves warm ; they wrap themselves up into a ball, hiding the head between the legs, and in this manner continue to sleep all day long. " Seba had one sent him from the island of Ceylon, which he permitted to run for some months about the house. It was heavy and slothful by day, and often could not be awakened even with a blow , but it made up this indolence by its nocturnal activity, smelling about without being either wholly tame or wholly mischievous. It climbed up the walls and the trees with very great ease, and appeared extremely fond of spiders and worms, which it preferred, probably from their resemblance to serpents, its most natural food. It was also particularly eager to scratch up holes in the ground ; and, this, added to its wildness and uncleanliness, obliged our naturalist to smother it in spirits, in order to preserve, and added it to the rest of his collection."

This animal was one of those formerly worshipped by the Egyptians, who considered every thing that was serviceable to them as an emanation of the Deity, and worshipped such as the best representatives of God below. Indeed, if we consider the number of eggs which the crocodile lays in the sand at a time, which often amounts to three or four hundred, we have reason to admire this little animal's usefulness as well as industry in destroying them, since otherwise the crocodile might be produced in sufficient numbers to overrun the whole earth.

THE STINKARDS.

This is a name which our sailors give to one or two animals of the weasel kind, which are chiefly found in America. All the weasel kind, as was already observed, have a very strong smell ; some of them indeed approaching to a perfume, but the greatest number most insupportably fœtid. But the smell of our weasels, and ermines, and polecats, is fragrance itself when compared to that of the *squash* and the *skunk*, which have been called the *polecats* of America These two are found in different parts of America, both differing in colour and fur, but both obviously of the weasel kind, as appears not only from their figure and odour, but also from their disposition. The squash is about the size of a polecat, its hair of a deep brown, but principally differing from all of this kind in having only four toes on the feet before, whereas all other weasels have five. The skink, which I take to be Catesby's Virginia polecat, resembles a polecat in shape and size, but particularly differs in the length of its hair and colour. The hair is above three inches and a half long, and that at the end of the tail above four inches. The colour is partly black and partly white, variously disposed over the body, very glossy, long, and beautiful. There seems to be two varieties more of this animal, which Mr. Buffon calls the *conepate* and the *zorille*. He supposes each to be a distinct species; but as they are both said to resemble the polecat in form, and both to be clothed with long fur of a black and white colour, it seems needless to make a distinction. The conepate resembles the skink in all things except in size, being smaller, and in the disposition of its colours, which are more exact, having five white stripes upon a black ground, running longitudinally from the head to the tail.—The zorille resembles the skink, but is rather smaller and more beautifully coloured, its streaks of black and white being more distinct, and the colours of its tail being black at its insertion and white at the extremity; whereas in the skink they are all of one gray colour.

But whatever differences there may be in the figure or colour of these little animals, they all agree in one common affection, that of being intolerably fœtid and loathsome. I have already observed that all the weasel kind have glands furnishing an odourous matter, near the anus, the couduits of which generally have their aperture just at its opening. That substance which is stored up in these receptacles, is in some of this kind, such as in the martin, already mentioned, and also in the genet and the civet, to be described hereafter, a most grateful perfume; but in the weasel, the ermine, the ferret, and the polecat, it is extremely fætid and offensive. These glands in the animal now under consideration, are much larger, and furnish a matter sublimed to a degree of putrescence, that is truly amazing. As to the perfumes of musk and civet, we know that a single grain will diffuse itself over a whole house, and continue for months to spread an agreeable odour, without diminution. However, the perfume of the musk or the civet is nothing, either for strength or duration, to the insupportable odour of these. It is usually voided with their excrement; and if but a single drop happens to touch any part of a man's garment, it is more than probabl that he can never wear any part of it more.

In describing the effects produced by the excrement of these animals, we often hear of its raising this diabolical smell by its urine However, of this I am apt to doubt; and it should seem to me, that, as all the weasel kind have their excrements so extremely fœtid from the cause above-mentioned, we may consider these also as being fœtid from the same causes. Besides, they are not furnished with glands to give their urine such a smell; and the analogy between them and the weasel kind being so strong in other respects, we may suppose they resemble each other in this. It has also been said that they take this weasel kind being so strong in other respects, we may suppose they resemble each other in this. It has also been said that they take this method of ejecting their excrement to defend themselves against their pursuers; but it is much more probable that this ejection is the convulsive effect of terror, and that it serves as their defence without their own concurrence. Certain it is that they never smell thus horridly except when enraged or affrighted, for they are often kept tame about the houses of the planters of America without being very offensive.

The habitudes of all these animals are the same, living like all the rest of the weasel kind, as they prey upon smaller animals and birds' eggs. The squash, for instance, burrows like the polecat in the clefts of rocks, where it brings forth its young. It often steals into farm-yards, and kills the poultry, eating only their brains. Nor is it safe to pursue or offend it, for then it calls up all its scents, which are its most powerful protection. At that time neither men nor dogs will offer to approach it; the scent is so strong that it reaches for half a mile round, and more near at hand is almost stifling. If the dogs continue to pursue, it does all in its power to escape, by getting up a tree, or by some such means; but if driven to an extremity, it then lets fly upon the hunters; and if it should happen that a drop of this fœtid discharge falls in the eye, the person runs the risk of being blinded for ever.*

The dogs themselves instantly abate of their ardour when they find this extraordinary battery played off against them; they instantly turn tail, and leave the animal undisputed master of the field; and no exhortations can ever bring them to rally. "In the year 1749," says Kalm, "one of these animals came near the farm where I lived. It was in winter time, during the night; and the dogs that were upon the watch, pursued it for some time, until it discharged against them. Although I was in my bed, a good way off, I thought I should have been suffocated; and the cows and oxen, by their lowing, showed how much they were affected by the stench. About the end of the same year, another of these animals crept into our cellar, but did not exhale the smallest scent, because it was not disturbed. A foolish woman, however, who perceived it at night, by the shining of its eyes, killed it, and at that moment its stench began to spread. The whole cellar was filled with it to such a degree, that the woman kept her bed for several days after; and all the bread, meat, and other provisions, that were kept there, were so infected that they were obliged to be thrown out of doors." Nevertheless many of the planters and native Americans keep this animal tame about their houses: and seldom perceive any disagreeable scents, except it is injured or frightened. They are also known to eat its flesh, which some assert to be tolerable food: however, they take care to deprive it of those glands which are so horridly offensive.

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*Voyage de Kalm, as quoted by Buffon. vol. xxvii. p. 93.

THE GENET

From the squash, which is the most offensive animal in nature, we come to the genet, which is one of the most beautiful and pleasing.—Instead of the horrid stench with which the former affects us, this has a most grateful odour; more faint than civet, but to some, for that reason, more agreeable This animal is rather less than the martin; though there are genets of different sizes, and I have seen one rather larger. It also differs somewhat in the form of its body. It is not easy in words to give an idea of the distinction. It resembles all those of the weasel kind, in its length, compared to its height; it resembles them in having a soft beautiful fur, in having its feet armed with claws that cannot be sheathed, and in its appetite for petty carnage. But then it differs from them in having the nose much smaller and longer, rather resembling that of a fox than a weasel. The tail, also, instead of being bushy, tapers to a point, and is much longer; its ears are larger, and its paws smaller. As to its colours, and figure in general, the genet is spotted with black, upon a ground mixed with red and grey. It has two sorts of hair, the one shorter and softer, the other longer and stronger, but not above half an inch long on any part of its body except the tail. Its spots are distinct and separate upon the sides, but unite towards the back, and form black stripes, which run longitudinally from the neck backwards. It has also along the back, a kind of mane or longish hair, which forms a black streak from the head to the tail, which last is marked with rings, alternately black and white, its whole length.

The genet, like all the rest of the weasel kinds, has glands that separate a kind of perfume, resembling civet, but which soon flies off. These glands open differently from those of other animals of this kind; for, as the latter have their apertures just at the opening of the anus, these have their aperture immediately under it; so that the male seems, for this reason, to the superficial observer, to be of two sexes.

It resembles the martin very much in its habits and disposition;* except, that it seems tamed much more easily. Belonius assures us, that he has seen them in the houses at Constantinople as tame as cats; and that they were permitted to run every where about, without doing the least mischief. For this reason they have been called the *cats of Constantinople;* although they have little else in common with that animal, except their skill in spying out and destroying vermin. Naturalists pretend that it inhabits only the moister grounds, and chiefly resides along the banks of rivers, having never been found in mountains, nor dry places. The species is not much diffused; it is not to be found in any part of Europe, except Spain and Turkey, it requires a warm climate to subsist and multiply in; and yet it is not to be found in the warmer regions either of India or Africa. From such as have seen its uses at Constantinople, I learn, that it is one of the most beautiful, cleanly, and industrious animals in the world; that it keeps what ever house it is in perfectly free from mice and rats which cannot endure its smell. Add to this, its nature is mild and gentle, its colours various and glossy, its fur valuable; and, upon the whole, it seems to be one of those animals that, with proper care, might be propagated amongst us, and might become one of the most serviceable of our domestics.

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* Buffon, vol. xix. p. 187.

THE CIVET

Proceeding from the smaller to the greater of this kind, we come, in the last place, to the Civet, which is much larger than any of the former; for as the martin is not above sixteen inches long, the civet is found to be above thirty. Mr. Buffon distinguishes this species into two kinds; one of which he calls the *civet*, and the other the *zibet*. The latter principally differs from the former in having the body longer and more slender, the nose smaller, the ears longer and broader: no mane or long hair running down the back in the latter; and the tail is longer and better marked with rings of different colours, from one end to the other. These are the differences which have induced this great naturalist to suppose them animals of distinct species; and to allot each a separate description. How far future experience may confirm this conjecture, time must discover; but certain it is, that if such small varieties makes a separate class, there may be many other animals equally entitled to peculiar distinction that are now classed together. We shall, therefore, content ourselves, at present, with considering, as former naturalists have done, these two merely as varieties of the same animal, and only altered in figure, by climate, food, or education.

The civet resembles animals of the weasel kind in the long slenderness of its body, the shortness of its legs, the odorous matter that exudes from the glands behind, the softness of its fur, the number of its claws, and their incapacity of being sheathed. It differs from them in being much larger than any hitherto described; in having the nose lengthened, so as to resemble that of the fox; the tail long, and tapering to a point; and its ears straight, like those of a cat. The colour of the civet varies; it is commonly ash, spotted with black; though it is whiter in the female, tending to yellow; and the spots are much larger, like those of the panther. The colour on the belly, and under the throat, is black; whereas the other parts of the body are black or streaked with grey. This animal varies in its colour, being sometimes streaked, as in our kind of cats called *tabbies*. It has whiskers, like the rest of its kind; and its eye is black and beautiful.

The opening of the pouch or bag, which is the receptacle of the civet, differs from that of the rest of the weasel kind, not opening into but under the anus. Besides this opening, which is large, there is still another lower down; but for what purposes designed, is not known. The pouch itself is about two inches and a half broad, and two long; its opening makes a chink from the top downwards, that is about two inches and a half long; and it is covered on the edges and within, with short hair; when the two sides are drawn asunder, the inward cavity may be seen, large enough to hold a small pullet's egg; all around this are small glands, opening and furnishing that strong perfume which is so well known, and is found in this pouch, of the colour and consistence of pomatum. Those who make it their business to breed these animals for their perfume, usually take it from them twice or thrice a week, and sometimes oftener. The animal is kept in a long sort of a box, in which it cannot turn round. The person, therefore, opens this box behind, drags the animal backwards by the tail, keeps it in this position by a bar before, and with a wooden spoon, takes the civet from the pouch, as carefully as he can; then lets the tail go, and shuts the box again. The perfume, thus procured, is put into a vessel, which he takes care to keep shut ; and when a sufficient quantity is procured, it is sold to very great advantage.

The civet,* although a native of the warmest climates, is found yet to live in temperate, and even cold countries, provided it be defended carefully from the injuries of the air. Wherefore, it is not only bred among the Turks, the Indians and Africans, but great numbers of these animals are also bred in Holland, where this scraping people make no small gain of its perfume. The perfume of Amsterdam is reckoned the purest of any ; the people of other countries adulterating it with gums, and other matters, which diminish its value, but increase its weight. The quantity which a single animal affords, generally depends upon its health and nourishment. It gives more in proportion as it is more delicately and abundantly fed. Raw flesh, hashed small, eggs, rice, birds, young fowls, and particularly fish, are the kinds of food the civet most delights in. These are to be changed and altered to suit and entice its appetite, and continue its health. It gets but very little water ; and although it drinks but rarely, yet it makes urine very frequently ; and upon such occasions, we cannot, as in other animals, distinguish the male from the female.

The perfume of the civet is so strong that it communicates itself to all parts of the animal's body; the fur is impregnated thereby, and the skin penetrated to such a degree that it continues to preserve the odour for a long time after it is stripped off. If a person be shut up with one of them in a close room, he cannot support the perfume, which is so copiously diffused. When the animal is irritated, as in all the weasel kind, its scent is much more violent than ordinary ; and if it be tormented so as to make it sweat, this also is a strong perfume, and serves to adulterate or increase what is otherwise obtained from it. In general, it is sold in Holland, for about fifty shillings an ounce : although, like all other commodities, its value alters in proportion to the demand. Civet must be chosen new, of a good consistence, a whitish colour, and a strong, disagreeable smell. There is still a very considerable traffic carried on from Bussorah, Calicut, and other places in India, where the animal that produces it is bred ; from the Levant also, from Guinea, and especially from Brazil in South America, although Mr. Buffon is of opinion that the animal is a native only of the Old Continent, and not to be found wild in the New. The best civet, however, is furnised as was observed, by the Dutch, thougn not in such quantities at present as some years past, when this perfume was more is a much more grateful perfume than musk, to which it has some resemblance; and was some years ago used for the same purposes in medicine. But, at present it is quite discontinued in prescription; and persons of taste or elegance seem to proscribe it even from the toilet. Perfumes, like dress, have their vicissitudes; musk was in peculiar repute, until displaced by civet; both gave ground upon discovering the manner of preparing ambergris; and even this is now disused for the less powerful vegetable kinds of fragrance, spirits of lavender, or otter of roses.

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* Buffon, vol. xix.

As to the rest, the civet is said to be a wild fierce animal; and, although sometimes tamed, is never thoroughly familiar. Its teeth are strong and cutting, although its claws be feeble and inflexible. It is light and active, and lives by prey, as the rest of its kind, pursuing birds, and other small animals that it is able to overcome. They are sometimes seen stealing into the yards and outhouses, to seize upon the poultry: their eyes shine in the night, and it is very probable that they see better in the dark than by day. When they fail of animal food, they are found to subsist upon roots and fruits, and very seldom drink; for which reason they are never found near great waters. They breed very fast in their native climates, where the heat seems to conduce to their propagation; but in our temperate latitudes, although they furnish their perfume in great quantities, yet they are not found to multiply.—A proof that their perfume has no analogy with their appetite for generation.

THE GLUTTON.

I will add but one animal more to this numerous class of the weasel kind; namely, the glutton; which, for several reasons, seems to belong to this tribe, and this only. We have hitherto had no precise description of this quadruped, some resembling it to a badger, some to a fox, and some to a hyæna. Linnæus places it among the weasels, from the similitude of its teeth; it should seem to me to resemble this animal still more, from the great length of its body, and the shortness of its legs, from the softness of its fur, its disagreeable scent, and its insatiable appetite for animal food. Mr. Klein, who saw one of them, which was brought alive from Siberia, assures us that it was about three feet long,* and about a foot and a half high. If we compare these dimensions with those of other animals, we shall find that they approach more nearly to the class we are at present describing than any other; and that the glutton may very justly be conceived under the form of a great, overgrown weasel.—Its nose, its ears, its teeth, and its long bushy tail, are entirely similar; and as to what is said of its being rather corpulent than slender, it is most probable that those who described it thus, saw it after eating, at which time, its belly, we are assured, is most monstrously distended: however, suspending all certainty upon this subject, I will take leave rather to follow Linnæus than Buffon, in describing this animal; and leave future experience to judge between them.

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* He says it was an ell, eight inches long: I have, therefore, given its length as supposing it to be a Flemish ell, which is twenty-seven inches.

The glutton, which is so called from its voracious appetite, is an animal found as well in the north of Europe and Siberia, as in the northern parts of America, where it has the name of the *carcajou*. Amidst the variety of descriptions which have been given of it, no very just idea can be formed of its figure; and, indeed, some naturalists, among whom was Ray, entirely doubted of its existence From the best accounts, however, we have of it, the body is thick and long, the legs short; it is black along the back, and of a reddish brown on the sides; its fur is held in the highest estimation, for its softness and beautiful gloss; the tail is bushy, like that of the weasel, but rather shorter; and its legs and claws are better fitted for climbing trees, than for running along the ground.—Thus far it entirely resembles the weasel; and its manner of taking its prey, is also by surprise, and not by pursuit.

Scarce any of the animals with short legs and long bodies pursue their prey; but knowing their own incapacity to overtake it by swiftness, either creep upon it in its retreats, or wait in ambush and seize it with a bound. The glutton, from the make of its legs, and the length of its body, must be particularly slow: and, consequently, its only resource is in taking its prey by surprise. All the rest of the weasel kind, from the smallness of their size, are better fitted for a life of insidious rapine than this; they can pursue their prey into its retreats, they can lurk unseen among the branches of trees, and hide themselves with ease under the leaves: but the glutton is too large to follow small prey into their retreats; nor would such, even if obtained, be sufficient to sustain it. For these reasons, therefore, this animal seems naturally compelled to the life for which it has long been remarkable. Its only resource is to climb a tree, which it does with great ease, and there it waits with patience until some large animal passes underneath, upon which it darts down with unerring certainty, and destroys it.

It is chiefly in North America that this voracious creature is seen lurking among the thick branches of trees, in order to surprise the deer, with which the extensive forests of that part of the world abound.—Endued with a degree of patience equal to its rapacity, the glutton singles out such trees as it observes marked by the teeth of the antlers of the deer; and is known to remain there watching for several days together. If it has fixed upon a wrong tree, and finds that the deer have either left that part of the country, or cautiously shun the place, it reluctantly descends, pursues the beaver to its retreat, or even ventures into the water in pursuit of fishes. But if it happens that, by long attention, and keeping close, at last the elk or the rein deer happens to pass that way, it at once darts down upon them, sticks its claws between their shoulders, and remains there unalterably firm. It is in vain that the large frighted animal increases its speed, or threatens with its branching horns; the glutton having taken possession of its post nothing can drive it off; its enormous prey drives rapidly along amongst the thickest wood, rubs itself against the largest trees, and tears down the branches with its expanded horns; but still its insatiable foe sticks behind, eating the neck, and digging its passage to the great blood vessels that lie in that part. Travellers who wander through those deserts often see pieces of the glutton's skin sticking to the trees, against which it was rubbed by the deer. But the animal's voracity is greater than its feelings and it never seizes without bringing down its prey. When, therefore, the deer, wounded and feeble with the loss of blood, falls, the glutton is seen to make up for its former abstinence by its present voracity As it is not possessed of a feast of this kind every day, it resolves to lay in a store to serve it for a good while to come. It is, indeed, amazing how much one of these animals can eat at a time! That which was seen by Mr. Klein, although without exercise or air, although taken from its native climate, and enjoying but an indifferent state of health, was yet seen to eat thirteen pounds of flesh every day, and yet remained unsatisfied. We may, therefore, easily conceive how much more it must devour at once, after a long fast, of a food of its own procuring, and in the climate most natural to its constitution. We are told accordingly, that from being a lank, thin animal, which it naturally is, it then gorges in such quantities, that its belly is distended, and its whole figure seems to alter. Thus voraciously it continues eating, till incapable of any other animal function, it lies totally torpid by the animal it has killed; and in this situation continues for two or three days. In this loathsome and helpless state, it finds its chief protection from its horrid smell, which few animals care to come near;* so that it continues eating and sleeping till its prey be devoured, bones and all, and then it mounts a tree, in quest of another adventure.

The glutton, like many others of the weasel kind, seems to prefer the most putrid flesh to that newly killed; and such is the voraciousness of this hateful creature, that, if its swiftness and strength were equal to its rapacity, it would soon thin the forest of every living creature. But, fortunately, it is so slow, that there is scarce a quadruped that cannot escape it, except the beaver. This, therefore, it very frequently pursues upon land; but the beaver generally makes good its retreat by taking to the water, where the glutton has no chance to succeed. This pursuit only happens in summer; for in winter all that remains is to attack the beaver's house, as at that time it never stirs from home.— This attack, however, seldom succeeds; for the beaver has a covert way bored under the ice, and the glutton has only the trouble and disappointment of sacking an empty town.

A life of necessity generally produces a good fertile invention. The glutton, continually pressed by the call of appetite, and having neither swiftness nor activity to satisfy it, is obliged to make up by stratagem the defects of Nature. It is often seen to examine the traps and the snares laid for other animals in order to anticipate the fowlers. It is said to practise a thousand arts to procure its prey, to steal upon the retreats of the rein-deer, the flesh of which animal it loves in preference to all others; to lie in wait for such animals as have been maimed by the hunters; to pursue the isatis while it is hunting for itself; and when that animal has run down its prey, to come in and seize upon the whole, and sometimes to devour even its poor provider; when these pursuits fail, even to dig up the graves, and fall upon the bodies interred there, devouring them, bones and all. For these reasons, the natives of the countries where the glutton inhabits. hold it in utter detestation, and usually term it the vulture of quadrupeds. And yet, it is extraordinary enough, that, being so very obnoxious to man it does not seem to fear him.* We are told by Gemelin of one of these coming up boldly and calmly where there were several persons at work, without testifying the smallest apprehension, or attempting to run until it had received some blows, that at last totally disabled it. In all probability it came among them seeking its prey; and, having been used to attack animals of inferior strength, it had no idea of a force superior to its own. The glutton, like all the rest of its kind, is a solitary animal; and is never seen in company except with its female, with which it couples in the midst of winter. The latter goes with young about four months, and brings forth two or three at a time.† They burrow in holes as the weasel; and the male and female are generally found together, both equally resolute in defence of their young. Upon this occasion the boldest dogs are afraid to appproach them; they fight obstinately, and bite most cruelly. However, as they are unable to escape by flight, the hunters come to the assistance of the dogs, and easily overpower them. Their flesh, it may readily be supposed, is not fit to be eaten; but the skins amply recompense the hunters for their toil and danger, The fur has the most beautiful lustre that can be imagined, and is preferred before all others, except that of the Siberian fox, or the sable. Among other peculiarities of this animal, Linnæus informs us that it is difficult to be skinned: but from what cause, whether its abominable stench, or the skin's tenacity to the flesh, he has not thought fit to inform us.

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* Linnæi Systema, p. 67.

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* Buffon.

† Linnæi Systema, p. 66.

BOOK V.

ANIMALS OF THE HARE KIND

INTRODUCTION

HAVING described in the last chapter a tribe of minute, fierce and rapacious animals, I come now to a race of minute animals of a more harmless and gentle kind, that, without being enemies to any, are preyed upon by all. As Nature has fitted the former for hostility, so it has entirely formed the latter for evasion ; and as the one kind subsists by their courage and activity, so the other find safety from their swiftness and their fears. The hare is the swiftest animal in the world for the time it continues ; and few quadrupeds can overtake even the rabbit when it has but a short way to run. To this class also, we may add the squirrel, somewhat resembling the hare and rabbit in its form and nature, and equally pretty, inoffensive, and pleasing.

If we were methodically to distinguish animals of the hare kind from all others, we might say that they have but two cutting teeth above and two below, that they are covered with a soft downy fur, and that they have a bushy tail. The combination of these marks might perhaps distinguish them tolerably well ; whether from the rat, the beaver, the otter, or any other most nearly approaching in form. But, as I have declined all method that rather tends to embarrass history than enlighten it, I am contented to class these animals together for no very precise reason, but because I find a general resemblance between them in their natural habits, and in the shape of their heads and body. I call the squirrel an animal of the hare kind, because it is something like a hare. I call the paca of the same kind, merely because it is more like a rabbit than any other animal I know of. In short, it is fit to erect some particular standard in the imagination of the reader, to refer him to some animal that he knows, in order to direct him in conceiving the figure of such as he does not know. Still, however, he should be apprized that his knowledge will be defective without an examination of each particular species ; and that saying an animal is of this or that particular kind is but a very trifling part of its history.

Animals of the hare kind, like all others that feed entirely upon vegetables, are inoffensive and timorous. As Nature furnishes them with a most abundant supply, they have not that rapacity after food, remarkable in such as are often stinted in their provision. They are extremely active and amazingly swift, to which they chiefly owe their protection; for being the prey of every voracious animal, they are incessantly pursued. The hare, the rabbit, and the squirrel, are placed by Pyerius, in his Treatise of Ruminating Animals, among the number of those that chew the cud; but how far this may be true I will not pretend to determine. Certain it is that their lips continually move whether sleeping or waking. Nevertheless they chew their meat very much before they swallow it, and for that reason I should suppose that it does not want a second mastication. All these animals use their fore-paws like hands; they are remarkably salacious, and are furnished by Nature with more ample powers than most others for the business of propagation. They are so very prolific, that were they not thinned by the constant depredations made upon them by most other animals, they would quickly over-run the earth.

THE HARE.

Of all these the hare is the largest, the most persecuted, and the most timorous; all its muscles are formed for swiftness; and all its senses seem only given to direct its flight. It has very large prominent eyes, placed backwards in its head, so that it can almost see behind it as it runs. These are never wholly closed; but as the animal is continually upon the watch, it sleeps with them open. The ears are still more remarkable for their size; they are moveable, and capable of being directed to every quarter; so that the smallest sounds are readily received, and the animal's motions directed accordingly.—The muscles of the body are very strong, and without fat, so that it may be said to carry no superfluous burden of flesh about it; the hinder feet are longer than the fore, which still adds to the rapidity of its motions; and almost all animals that are remarkable for their speed, except the horse, are formed in the same manner.

An animal so well formed for a life of escape might be supposed to enjoy a state of tolerable security; but as every rapacious creature is its enemy, it but very seldom lives out its natural term. Dogs of all kinds pursue it by instinct, and follow the hare more eagerly than any other animal. The cat and the weasel kinds are continually lying in ambush, and practising all their little arts to seize it; birds of prey are still more dangerous enemies, as against them no swiftness can avail, nor retreat secure; but man, an enemy far more powerful than all, prefers its flesh to that of other animals, and destroys greater numbers than all the rest. Thus pursued and persecuted on every side, the race would long since have been totally extirpated, did it not find a resource in its amazing fertility.

The hare multiplies exceedingly; it is in a state of engendering at a few months old; the female goes with young but thirty days, and generally brings forth three or four at a time.* As soon as they have produced their young, they are again ready for conception, and thus do not lose any time in continuing the breed. But they are in another respect fitted in an extraordinary manner for multiplying their kind ; for the female, from the conformation of her womb, is often seen to bring forth, and yet to continue pregnant at the same time ; or in other words, to have young ones of different ages in her womb together.—Other animals never receive the male when pregnant, but bring forth their young at once. But it is frequently different with the hare ; the female often, though already impregnated, admitting the male, and thus receiving a second impregnation. The reason of this extraordinary circumstance is, that the womb in these animals is divided in such a manner that it may be considered as a double organ, one side of which may be filled while the other remains empty. Thus these animals may be seen to couple at every period of their pregnancy, and even, while they are bringing forth young, laying the foundation of another brood.

The young of these animals are brought forth, with their eyes open, and the dam suckles them for twenty days, after which they leave her, and seek out for themselves.† From this we observe, that the education these animals receive is but trifling, and the family connection but of a short duration. In the rapacious kinds the dam leads her young forth for months together ; teaches them the arts of rapine ; and although she wants milk to supply them, yet keeps them under her care until they are able to hunt for themselves. But a long connection of this kind, would be very unnecessary as well as dangerous to the timid animals we are describing ; their food is easily procured and their associations, instead of protection, would only expose them to their pursuers. They seldom, however, separate far from each other, or from the place where they were produced ; but make each a form at some distance, having a predilection rather for the place than each other's society. They feed during the night rather than by day, choosing the more tender blades of grass, and quenching their thirst with the dew. They live also upon roots, leaves, fruits and corn, and prefer such plants as are furnished with a milky juice. They also strip the bark off trees during the winter, there being scarce any that they will not feed on, except the lime or the alder. They are particularly fond of birch, pinks, and parsley. When they are kept tame, they are fed with lettuce and other garden herbs ; but the flesh of such as are thus brought up is always indifferent.

They sleep or repose in their forms by day, and may be said to live only by night.‡ It is then that they go forth to feed and couple.—They do not pair, however, but in the rutting season, which begins in February ; the male pursues and discovers the female by the sagacity of its nose. They are then seen by moon-light, playing, skipping, and pursuing each other ; but the least motion, the slightest breeze, the falling of a leaf is sufficient to disturb their revels ; they instantly fly off, and each takes a separate way.

* Buffon, vol xiii. p. 12 † Ibid. ‡ Ibid.

As their limbs are made for running, they easily outstrip all other animals in the beginning; and could they preserve their speed, it would be impossible to overtake them; but as they exhaust their strength at their first efforts, and double back to the place where they were started from, they are more easily taken than the fox, which is a much slower animal than they. As their hind legs are longer than the fore, they always choose to run up hill, by which the speed of their pursuers is diminished, while theirs remains the same. Their motions are also without any noise, as they have the sole of the foot furnished with hair; and they seem the only animals that have hair on the inside of their mouths.

They seldom live above seven or eight years at the utmost; they come to their full perfection in a year; and this multiplied by seven, as in other animals, gives the extent of their lives.* It is said, however, that the females live longer than the males: of this Mr. Buffon makes a doubt; but I am assured that it is so. They pass their lives in our climate, in solitude and silence; and they seldom are heard to cry, except when they are seized or wounded. Their voice is not so sharp as the note of some other animals, but more nearly approaching that of the squalling of a child. They are not so wild as their dispositions and their habits seem to indicate; but are of a complying nature, and easily susceptible of a kind of education. They are easily tamed. They even become fond and caressing, but they are incapable of attachment to any particular person, and never can be depended upon; for though taken never so young, they regain their native freedom at the first opportunity. As they have a remarkable good ear, and sit upon their hind legs, and use their fore-paws as hands, they have been taught to beat the drum, to dance to music, and to go through the manual exercise.

But their natural instincts for their preservation are much more extraordinary than those artificial tricks that are taught them. They make themselves a form, particularly in those places where the colour of the grass most resembles that of their skin; it is open to the south in winter and to the north in summer. The hare, when it hears the hounds at a distance, flies for some time through a natural impulse, without managing its strength, or consulting any other means but speed for its safety. Having attained some hill or rising ground, and left the dogs so far behind that it no longer hears their cries, it stops, rears on its hinder legs, and at length looks back to see if it has not lost its pursuers. But these, having once fallen upon the scent, pursue slowly and with united skill, and the poor animal soon again hears the fatal tidings of their approach. Sometimes when sore hunted it will start a fresh hare, and squat in the same form; sometimes it will creep under the door of a sheep-cot, and hide among the sheep; sometimes it will run among them, and no vigilance can drive it from the flock; some will enter holes like the rabbit, which the hunters calls going to *vault*, some will go up one side of the hedge and come down the other; and it has been known that a hare sorely hunted has got upon the top of a quick-set hedge, and run a good way thereon, by which it has effect-ally evaded the hounds. It is no unusual thing for them to betake themselves to furze bushes, and to leap from one to another, by which the dogs are frequently misled. However, the first doubling a hare makes is generally a key to all his future attempts of that kind, the latter being exactly like the former. The young hares tread heavier, and leave a stronger scent than the old, because their limbs are weaker; and the more this forlorn creature tires, the heavier it treads, and the stronger is the scent it leaves. A buck, or male hare is known by its choosing to run upon hard high-ways, feeding farther from the wood-sides, and making its doubling of a greater compass than the female.—The male having made a turn or two about its form, frequently leads the hounds five or six miles on a stretch; but the female keeps close by some covert side, turns, crosses, and winds among the bushes like a rabbit, and seldom runs directly forward. In general, however, both male and female regulate their conduct according to the weather. In a moist day they hold by the highways more than at any other time, because the scent is then strongest upon the grass. If they come to the side of a grove or spring, they forbear to enter, but squat down by the side thereof until the hounds have overshot them; and then, turning along their former path, make to their old form, from which they vainly hope for protection.

Hares are divided, by the hunters, into mountain and measled hares. The former are more swift, vigorous, and have the flesh better tasted; the latter chiefly frequent the marshes, when hunted keep among low grounds, and their flesh is moist, white, and flabby. When the male and female keep one particular spot, they will not suffer any strange hare to make its form in the same quarter, so that it is usually said, that the more you hunt, the more hares you shall have; for, having killed one hare, others come and take possession of its form. Many of these animals are found to live in woods and thickets, but they are naturally fonder of the open country, and are constrained only by fear, to take shelter in places that afford them neither a warm sun, nor an agreeable pasture. They are, therefore, usually seen stealing out of the edges of the wood to taste the grass that grows shorter and sweeter in the open fields than under the shade of the trees; however, they seldom miss of being pursued; and every excursion is a new adventure. They are shot at by poachers; traced by their footsteps in the snow; caught in springes; dogs, birds, and cats, are all combined against them; ants, snakes, and adders, drive them from their forms, especially in summer; even fleas, from which most other animals are free, persecute this poor creature; and, so various are its enemies, that it is seldom permitted to reach even that short term to which it is limited by Nature.

The soil and climate have their influence upon this animal as well as on most others. In the countries bordering on the north pole, they become white in winter, and are often seen in great troops of four or five hundred, running along the banks of the river Irtish, or the Jenisca, and are white as the snow they tread on. They are caught in traps for the sake of their skins, which, on the spot, are sold for less than seven shillings a hundred. Their fur is well known to form a considerable article in the hat manufacture; and we accordingly in port vast quantities of it from those countries where the hare abounds in such plenty. They are found also entirely black, but these in much less quantities than the former;[*] and even some have been seen with horns, though these but rarely.[†]

The hares of the hot countries, particularly in Italy, Spain, and Barbary, are smaller than ours: those bred in the Milanese country are said to be the best in Europe.[‡] There is scarce a country where this animal is not to be found, from the torrid zone to the neighbourhood of the polar circle. The natives of Guinea knock them on the head as they come down to the sides of the rivers to drink. They also surround the place where they are seen in numbers, and clattering a short stick, which every man carries, against that which the person next him carries, they diminish their circle gradually, till the hares are cooped up in the midst. They then altogether throw their sticks in among them, and with such deadly force, that they seldom fail of killing great numbers at a time.[§]

The flesh of this animal has been esteemed as a delicacy among some nations, and is held in detestation by others.—The Jews, the ancient Britons, and the Mahometans, all considered it as an unclean animal, and religiously abstained from it. On the contrary, there are scarce any other people, however barbarous at present, that do not consider it as the most agreeable food. Fashion seems to preside and govern all the senses; what mankind at one time consider as beautiful, fragrant, or savoury, may at another time, or among other nations, be regarded as deformed, disgustful, or ill-tasted. That flesh which the ancient Romans so much admired as to call it the food of the wise, was among the Jews and the Druids, thought unfit to be eaten; and even the moderns, who, like the Romans, consider the flesh of this animal as a delicacy, have very different ideas as to dressing it. With us it is simply served up without much seasoning; but Apicius shows us the manner of dressing a hare in true Roman taste, with parsley, rice, vinegar, cummin seed and coriander.[‖]

THE RABBIT.

The hare and the rabbit, though so very nearly resembling each other in form and disposition, are yet distinct kinds, as they refuse to mix with each other. Mr. Buffon bred up several of both kinds in the same place; but from being at first indifferent, they soon became enemies; and their combats were generally continued until one of them was disabled or destroyed. However, though these experiments were not attended with success, I am assured that nothing is more frequent than an animal bred between these two, but which, like the mule, is marked with sterility.—Nay, it has been actually known that the rabbit couples with animals of a much more distant nature; and there is at present in the museum at Brussels, a creature covered with feathers and hair, and said to be bred between a rabbit and a hen. The fecundity of the rabbit is still greater than that of the hare; and if we should calculate the produce from a single pair in one year, the number would be amazing. They breed seven times in a year, and bring eight young ones each time. On a supposition, therefore, that this happens regularly, at the end of four years, a couple of rabbits shall see a progeny of almost a million and a half. From hence we must justly apprehend being overstocked by their increase; but happily for mankind, their enemies are numerous, and their nature inoffensive; so that their destruction bears a near proportion to their fertility.

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[*] Klein. Disp. Quadrup. p. 52.

[†] Johnston de Quadrup. L. ii. C. 2.

[‡] Dictionnaire Raisonnée Liever.

[§] Hist. Gen. des Voyages, tom. iv. p. 171

[‖] Vide. Apicii, &c.

But although their numbers be diminished by every beast and bird of prey, and still more by man himself, yet there is no danger of their extirpation. The hare is a poor, defenceless animal, that has nothing but its swiftness to depend on for safety; its numbers are, therefore, every day decreasing; and in countries that are well peopled, the species are so much kept under, that laws are made for their preservation. Still, however, it is most likely that they will be at last totally destroyed; and, like the wolf or the elk in some countries, be only kept in remembrance. But it is otherwise with the rabbit, its fecundity being greater, and its means of safety more certain. The hare seems to have more various arts and instincts to escape its pursuers, by doubling, squatting and winding; the rabbit has but one art of defence alone, but in that one finds safety; by making itself a hole, where it continues a great part of the day, and breeds up its young; there it continues secure from the fox, the hound, the kite, and every other enemy.

Nevertheless, though this retreat be safe and convenient, the rabbit does not seem to be naturally fond of keeping there. It loves the sunny field and the open pasture; it seems to be a chilly animal, and dislikes the coldness of its underground habitation. It is, therefore continually out, when it does not fear disturbance; and the female often brings forth her young at a distance from the warren, in a hole, not above a foot deep at the most. There she suckles them for about a month, covering them over with moss and grass, whenever she goes to pasture, and scratching them up at her return. Is has been said, indeed, that this shallow hole without the warren, is made lest the male should attack and destroy her young; but I have seen the male himself attend the young there, lead them out to feed, and conduct them back upon the return of the dam. This external retreat seems a kind of country house, at a distance from the general habitation; it is usually made near some spot of excellent pasture, or in the midst of a field of sprouting corn. To this both male and female often retire from the warren; lead their young by night to the food which lies so convenient, and, if not disturbed, continue there till they are grown up.—There they find a greater variety of pasture than near the warren, which is generally eaten bare; and enjoy a warmer sun, by covering themselves up in a shallower hole. Whenever they are disturbed, they then forsake their retreat of pleasure for one of safety; they fly to the warren with their utmost speed; and if the way be short, there is scarce any dog, how swift soever, that can overtake them.

But it does not always happen that these animals are possessed of one of these external apartments; they most usually bring forth their young in the warren, but always in a hole separate from the male On these occasions the female digs herself a hole,* different from the ordinary one, by being more intricate; at the bottom of which she makes a more ample apartment. This done, she pulls off from her belly a good quantity of her hair, with which she makes a kind of bed for her young. During the two first days she never leaves them; and does not stir out but to procure nourishment, which she takes with the utmost dispatch; in this manner suckling her young for near six weeks, until they are strong, and able to go abroad themselves. During all this time, the male seldom visits their separate apartment; but when they are grown up, so as to come to the mouth of the hole, he then seems to acknowledge them as his offspring, takes them between his paws, smoothes their skin and licks their eyes; all of them, one after the other, have an equal share in his caresses.

In this manner the rabbit, when wild, consults its pleasure and its safety; but those that are bred up tame, do not take the trouble of digging a hole, conscious of being already protected. It has also been observed,† that when people, to make a warren, stock it with tame rabbits, these animals having been accustomed to the art of scraping a hole, continue exposed to the weather, and every other accident, without ever burrowing. Their immediate offspring also, are equally regardless of their safety: and it is not till after two or three generations, that these animals begin to find the necessity and convenience of an asylum, and practise an art which they could only learn from Nature.

Rabbits of the domestic breed, like all other animals that are under the protection of man, are of various colours, white, brown, black, and mouse-colour. The black are the most scarce; the brown, white, and mouse-colour are in greater plenty. Most of the wild rabbits are of a brown, and it is the colour which prevails among the species; for in every nest of rabbits, whether the parent be black or white, there are some brown ones found of the number. But, in England, there are many warrens stocked with the mouse-coloured kinds, which, some say, came originally from an island in the river Humber, and which still continue their original colour, after a great number of successive generations. A gentleman,‡ who bred up tame rabbits for his amusement, gives the following account of their production: "I began," says he, "by having but one male and female only; the male was entirely white, and the female brown; but in their posterity the number of the brown, by far exceeded those of any other colour: there were some white, some party coloured, and some black. It is surprising how much the descendants were submissive and obedient to their common parent; he was easily distinguished from the rest by his superior whiteness; and however numerous the other males were, this kept them all in subjection. Whenever they quarrelled among each other either for their females or provisions, as soon as he heard the noise he ran up to them with all despatch, and, upon his appearance, all was instantly reduced to peace and order. If he caught any of them in the fact, he instantly punished them as an example to the rest. Another instance of his superiority was, that having accustomed them to come to me with the call of a whistle, the instant this signal was given, I saw him marshalling them up, leading them the foremost, and then suffering them all to file off before him."

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* Buffon, † Ibid. ‡ Mr. Moutier, as quoted by Mr Buffon

The rabbit,* though less than the hare, generally lives longer. As these animals pass the greater part of their lives in their burrow, where they continue at ease and unmolested, they have nothing to prevent the regularity of their health or the due course of their nourishment.—They are, therefore, generally found fatter than the hare; but their flesh is, notwithstanding, much less delicate. That of the old ones, in particular, is hard, tough, and dry; but it is said, that in warmer countries, they are better tasted. This may very well be, as the rabbit, though so very plentiful in Great Britain and Ireland, is nevertheless, a native of the warmer climates; and has been originally imported into these kingdoms from Spain. In that country and in some of the islands in the Mediterranean, we are told that they once multiplied in such numbers as to prove the greatest nuisance to the natives. They at first demanded military aid to destroy them; but soon after they called in the assistance of ferrets, which originally came from Africa, and these with much more ease and expedition, contrived to lessen the calamity. In fact, rabbits are found to love a warm climate, and to be incapable of bearing the cold of the north; so that in Sweden they are obliged to be littered in the houses. It is otherwise in all the tropical climates, where they are extremely common, and where they seldom burrow, as with us. The English counties that are most noted for these animals are Lincolnshire, Norfolk, and Cambridgeshire. They delight in grounds of a sandy soil, which are warmer than those of clay; and which also furnish a softer and finer pasture.

The tame rabbits are larger than the wild ones, from their taking more nourishment, and using less exercise; but their flesh is not so good, being more insipid and softer. In order to improve it they are chiefly fed upon bran, and are stinted in their water; for if indulged in too great plenty of moist food, they are apt, as the feeders express it, to grow rotten. The hair or fur is a very useful commodity, and is employed in England for several purposes, as well when the skin is dressed with it on, as when it is pulled off. The skins, especially the white, are used for lining clothes, and are considered as a cheap imitation of ermine. The skin of the male is usually preferred, as being the most lasting, but it is coarser; that on the belly in either sex, is the best and finest. But the chief use made of rabbit's fur, is in the manufacture of hats; it is always mixed in certain proportions, with the fur of the beaver; and it is said to give the latter more strength and consistence.

The Syrian rabbit, like all other animals bred in that country, is remarkable for the length of its hair; it falls along the sides in wavy wreaths, and is, in some places, curled at the end, like wool; it is shed once a year in large masses; and it often happens that the rabbit, dragging a part of its robe on the ground, appears as if it had got another leg, or a longer tail. There are no rabbits naturally in America; however, those that have been carried from Europe, are found to multiply in the West India islands in great abundance. In other parts of that continent, they have animals that in some measure resemble the rabbits of Europe; and which most European travellers have often called *hares or rabbits*, as they happened to be large or small. Their giving them even the name will be a sufficient excuse for my placing them among animals of the hare kind; although they may differ in many of the most essential particulars. But before we go to the new continent, we will examine such as bear even a distant resemblance to the hare kind at home.

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* Mr. Moutier, as quoted by Mr. Buffon

THE SQUIRREL.

There are few readers that are not as well acquainted with the figure of a Squirrel as that of the rabbit; but supposing it unknown to any, we migh give them some idea of its form by comparing it to a rabbit, with shorter ears and a longer tail. The tail, indeed, is alone sufficient to distinguish it from all others, as it is extremely long, beautiful, and bushy, spreading like a fan, and which, when thrown up behind, covers the whole body. This serves the little animal for a double purpose; when erected, it serves, like an umbrella, as a secure protection from the injuries of the heat and cold; and when extended, it is very instrumental in promoting those vast leaps that the squirrel takes from tree to tree; nay, some assert that it answers still a third purpose, and when the squirrel takes to the water, which it sometimes does upon a piece of bark, that its tail serves it instead of a sail.*

There are few wild animals in which there are so many varieties as in the squirrel. The *common squirrel* is of the size of a small rabbit, and is rather of a more reddish brown.

The belly and breast are white; and the ears beautifully ornamented with long tufts of hair, of a deeper colour than that on the body.—The eyes are large, black, and lively; the legs are short and muscular, like those of the rabbit; but the toes longer, and the claws sharper, so as to fit it for climbing. When it eats, or dresses itself, it sits erect, like the hare or rabbit, making use of its fore legs as hands; and chiefly resides in trees. The *grey Virginian squirrel*, which Mr. Buffon calls the *petit gris*, is larger than a rabbit, and of a greyish colour.

Its body and limbs are thicker than those of the common squirrel; and its ears are shorter, and without tufts at the point. The upper part of the body, and external part of the legs, are of a fine whitish grey, with a beautiful red streak on each side lengthways. The tail is covered with very long grey hair, variegated, with black and white towards the extremity. This variety seems to be common to both continents; and in Sweden is seen to change colour in winter. The *Barbary squirrel*, of which Mr. Buffon makes three varieties, is of a mixed colour, between red and black. Along the sides there are white and brown lines, which render this animal very beautiful; but what still adds to its elegance is, that the belly is of a sky blue, surrounded with white. Some of these hold up the tail erect; and others throw it forward over their body. The *Siberian white squirrel* is of the size of a common squirrel. The *Carolina black squirrel* is much bigger than the former, and sometimes tipped with white at the extremities. The *Brasilian squirrel*, which Mr. Buffon calls the *coquallin*, is a beautiful animal of this kind, and very remarkable for the variety of its colours. Its belly is of a bright yellow; its head and body variegated with white, black, brown, and orange colour. It wants the tufts at the extremity of its ears; and does not climb trees, as most of the kind are seen to do. To this list may be added the *little ground sqirrel of Carolina* of a reddish colour, and blackish stripes on each side; and like the former, not delighting in trees. Lastly, the *squirrel of New Spain*, which is of a deep iron-grey colour, with seven longitudinal whitish streaks along the sides of the male, and five along those of the female. As for the flying squirrels, they are of a distinct kind, and shall be treated by themselves.

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* Klein. Linnæus.

These, which I suppose to be but a few of the numerous varieties of the squirrel, sufficiently serve to show how extensively this animal is diffused over all parts of the world. It is not to be supposed, however, that every variety is capable of sustaining every climate; for few animals are so tender, or so little able to endure a change of abode, as this. Those bred in the tropical climates, will only live near a warm sun; while, on the contrary, the squirrel of Siberia will scarce endure the temperature of ours. These varieties do not only differ in their constitutions and colour, but in their dispositions also; for while some live on the tops of trees, others feed, like rabbits, on vegetables below. Whether any of these, so variously coloured, and so differently, disposed, would breed among each other, we cannot tell: and since, therefore, we are left in uncertainty upon this point, we are at liberty either to consider each as a distinct species by itself; or only a variety, that accident might have originally produced, and that the climate or soil might have continued. For my own part, as the original character of the squirrel is so strongly marked upon them all, I cannot help considering them in the latter point of view; rather as the common descendants of one parent, than originally formed with such distinct similitudes.

The squirrel is a beautiful little animal,* which is but half savage; and which, from the gentleness and innocence of its manners, deserves our protection. It is neither carnivorous nor hurtful: its usual food is fruits, nuts, and acorns; it is cleanly, nimble, active, and industrious; its eyes are sparkling, and its physiognomy marked with meaning. It generally, like the hare and rabbit, sits up on its hinder legs; and uses the fore paws as hands; these have five *claws* or *toes*, as they are called, and one of them is separated from the rest like a thumb. This animal seems to approach the nature of birds, from its lightness, and surprising agility on the tops of trees. It seldom descends to the ground, except in case of storm, but jumps from one branch to another; feeds, in spring, on the buds and young shoots; in summer, on the ripening fruits; and particularly the young cones of the pine tree. In autumn it has an extensive variety to feast upon; the acorn, the filbert, the chesnut, and the wilding. This season of plenty, however, is not spent in idle enjoyment; the provident little animal gathers at that time its provisions for the winter; and cautiously foresees the season when the forest shall be stripped of its leaves and fruitage.

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* Buffon.

Its nest is generally formed among the large branches of a great tree, where they begin to fork off in small ones. After choosing the place where the timber begins to decay, that a hollow may more easily be formed, the squirrel begins by making a kind of a level between the forks; and then bringing moss, twigs, and dry leaves, it binds them together with great art, so as to resist the most violent storm. This is covered up on all sides; and has but a single opening at top, which is just large enough to admit the little animal; and this opening is itself defended from the weather by a kind of canopy, made in the fashion of a cone, so that it throws off the rain, though never so heavy. The nest thus formed, with a very little opening above, is, nevertheless, very commodious and roomy below; soft, well knit together, and every way convenient and warm. In this retreat the little animal brings forth its young, shelters itself from the scorching heat of the sun, which it seems to fear, and from the storms and inclemency of winter, which it is still less capable of supporting. Its provision of nuts and acorns is seldom in its nest, but in the hollows of the tree, laid up carefully together, and never touched but in cases of necessity. Thus one single tree serves for a reteat and a store-house; and without leaving it during the winter, the squirrel possesses all those enjoyments that its nature is capable of receiving. But it sometimes happens that its little mansion is attacked by a deadly and powerful foe. The martin goes often in quest of a retreat for its young, which it is incapable of making for itself; for this reason it fixes upon the nest of a squirrel, and with double injustice, destroys the tenant, and then takes possession of the mansion.

However, this is a calamity that but seldom happens; and, of all other animals, the squirrel leads the most frolicksome, playful life, being surrounded with abundance, and having few enemies to fear.—They are in heat early in the spring; when, as a modern naturalist says,* it is very diverting to see the female feigning an escape from the pursuit of two or three males, and to observe the various proofs which they give of their agility, which is then exerted in full force. Nature seems to have been particular in her formation of these animals for propagation: however they seldom bring forth above four or five young at a time; and that but once a year. The time of their gestation seems to be about six weeks; they are pregnant in the beginning of April, and bring forth about the middle of May.

The squirrel is never found in the open fields, nor yet in the copses or underwoods; it always keeps in the midst of the tallest trees, and, as much as possible shuns the habitations of men. It is extremely watchful; if the tree in which it resides be but touched at the bottom, the squirrel instantly takes the alarm, quits its nest, at once flies off to another tree, and thus travels, with great ease, along the tops of the forest, until it finds itself perfectly out of danger. In this manner it continues for some hours at a distance from home, until the alarm be passed away; and then it returns, by paths, that to all quadrupeds but itself, are utterly impassable. Its usual way of moving is by bounds; these it takes from one tree to another, at forty feet distance; and if at any time it is obliged to descend, it runs up the side of the next tree with amazing facility. It has an extremely sharp piercing note, which most usually expresses pain; it has another more like the purring of a cat, which it employs when pleased; at least it appeared so in that from whence I have taken a part of this description.

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* British Zoology.

In Lapland, and the extensive forests to the north, the squirrels are observed to change their habitation, and to remove in vast numbers from one country to another. In these migrations they are generally seen by thousands, travelling directly forward; while neither rocks, forests, nor even the broadest waters can stop their progress. What I am going to relate, appears so extraordinary, that were it not attested by numbers of the most credible historians, among whom are Klein and Linnæus, it might be rejected, with that scorn which we treat imposture or credulity: however, nothing can be more true than that when these animals, in their progress, meet with broad rivers, or extensive lakes which abound in Lapland, they take a very extraordinary method of crossing them. Upon approaching the banks, and perceiving the breadth of the water, they return, as if by common consent, into the neighbouring forest, each in quest of a piece of bark, which answers all the purposes of boats for wafting them over. When the whole company are fitted in this manner, they boldly commit their little fleet to the waves; every squirrel sitting on its own piece of bark, and fanning the air with its tail, to drive the vessel to its desired port. In this orderly manner they set forward, and often cross lakes several miles broad. But it too often happens that the poor mariners are not aware of the dangers of their navigation; for although at the edge of the water it is generally calm, in the midst it is always more turbulent.—There the slightest additional gust of wind oversets the little sailor and his vessel together. The whole navy, that but a few minutes before rode proudly and securely along, is now overturned, and a shipwreck of two or three thousand sail ensues. This, which is so unfortunate for the little animal, is generally the most lucky accident in the world for the Laplander on the shore; who gathers up the dead bodies as they are thrown in by the waves, eats the flesh, and sells the skins for about a shilling the dozen.*

The squirrel is easily tamed, and it is then a very familiar animal. It loves to lie warm, and will often creep into a man's pocket or his bosom. It is usually kept in a box and fed with hazel nuts. Some find amusement in observing with what ease it bites the nut open and eats the kernel. In short, it is a pleasing, pretty little domestic; and its tricks and habitudes may serve to entertain a mind unequal to stronger operations.

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* Oeuvres de Regnard

Ant Bear, p. 19, vol. iii.

Ant Eater, p. 19, vol. iii.

Flying Squirrel, p. 191.

To face p. 191 vol. ii.

THE FLYING SQUIRREL.

Mr. Ray was justly of opinion that the flying Squirrel might more properly be said to be of the rat kind, because its fur is shorter than in other squirrels, and its colours also more nearly approach the former. However, as mankind have been content to class it among the squirrels, it is scarcely worth making a new distinction in its favour. This little animal, which is frequently brought over to England, is less than a common squirrel and bigger than a field mouse. Its skin is very soft, and elegantly adorned with a dark fur in some places, and light grey in others. It has large prominent black and very sparkling eyes, small ears, and very sharp teeth, with which it gnaws any thing quickly.— When it does not leap, its tail, which is pretty enough, lies close to its back; but when it takes its spring, the tail is moved backwards and forwards from side to side. It is said to partake somewhat of the nature of the squirrel, of the rat, and of the dormouse; but that in which it is distinguished from all other animals, is its peculiar conformation for taking those leaps that almost look like flying. It is, indeed, amazing to see it at one bound dart above a hundred yards from one tree to another. They are assisted in this spring by a very peculiar formation of the skin that extends from the fore-feet to the hinder; so that when the animal stretches its fore-legs forward and its hind-legs backward, this skin is spread out between them somewhat like that between the legs of a bat. The surface of the body being thus increased, the little animal keeps bouyant in the air until the force of its first impulsion is expired, and then it descends. This skin, when the creature is at rest, or walking, continues wrinkled upon its sides; but when its limbs are extended, it forms a kind of web between them of above an inch broad on either side, and gives the whole body the appearance of a skin floating in the air. In this manner the flying squirrel changes place, not like a bird, by repeated strokes of its wings, but rather like a paper kite, supported by the expansion of the surface of its body; but with this difference however, that, being naturally heavier than the air, instead of mounting it descends; and that jump, which upon the ground would not be above forty yards, when from a higher tree to a lower may be above a hundred.

This little animal is more common in America than in Europe, but not very commonly to be seen in either. It is usually found, like the squirrel, on the tops of trees; but, though better fitted for leaping, it is of a more torpid disposition, and is seldom seen to exert its powers; so that it is often seized by the polecat and the martin. It is easily tamed, but apt to break away whenever it finds an opportunity. It does not seem fond of nuts or almonds, like other squirrels, but is chiefly pleased with the sprouts of the birch, and the cones of the pine. It is fed in its tame state with bread and fruits; it generally sleeps by day, and is always most active by night. Some naturalists gravely caution us not to let it get among our corn fields, where, they tell us, it will do a great deal of damage, by cropping the corn as soon as it begins to ear !*

THE MARMOT.

From the description of the squirrel and its varieties, we proceed to a different tribe of animals, no way indeed resembling the squirrel, but still something like the rabbit and the hare. We are to keep these two animals still in view as the centre of our comparison ; as objects to which many others may bear some similitude, though they but little approach each other. Among the hare kind is the Marmot, which naturalists have placed either among the hare kind or the rat kind, as it suited their respective systems. In fact, it bears no great resemblance to either : but of the two it approaches much nearer the hare, as well in the make of its head as in its size, in its bushy tail, and particularly in its chewing the cud, which alone is sufficient to determine our choice in giving it its present situation. How it ever came to be degraded into the rat or mouse I cannot conceive, for it no way resembles them in size, being near as big as a hare ; or in its disposition, since no animal is more tractable nor more easily tamed.

The marmot is, as was said, almost as big as a hare, but it is more corpulent than a cat, and has shorter legs. Its head pretty nearly resembles that of a hare, except that its ears are much shorter. It is clothed all over with very long hair, and a shorter fur below.—These are of different colours, black and grey. The length of the hair gives the body the appearance of greater corpulence than it really has, and at the same time shortens the feet, so that its belly seems touching the ground. Its tail is tufted and well furnished with hair, and it is carried in a straight direction with its body. It has five claws behind, and only four before. These it uses, as the squirrel does, to carry its food to its mouth ; and it usually sits upon its hinder parts to feed, in the manner of that little animal.

The marmot is chiefly a native of the Alps ; and when taken young is tamed more easily than any other wild animal, and almost as perfectly as any of those that are domestic.† It is readily taught to dance, to wield a cudgel, and to obey the voice of its master. Like the cat, it has an antipathy to the dog ; and when it becomes familiar to the family, and is sure of being supported by its master, it attacks and bites even the largest mastiff. From its squat, muscular make, it has great strength joined to great agility. It has four large cutting teeth, like all those of the hare kind, but it uses them to much more advantage, since in this animal they are very formidable weapons of defence. However, it is in general a very inoffensive animal ; and, except its enmity to dogs, seems to live in friendship with every creature, unless when provoked. If not prevented, it is very apt to gnaw the furniture of a house, and even to make holes through wooden partitions; from whence, perhaps, it has been compared to the rat. As its legs are very short, and made somewhat like those of a bear, it is often seen sitting up, and even walking on its hind legs in like manner; but with the fore-paws, as was said, it uses to feed itself in the manner of a squirrel Like all of the hare kind, it runs much swifter up hill than down; it climbs trees with great ease, and runs up the clifts of rocks or the contiguous walls of houses with great facility. It is ludicrously said that the Savoyards, who are the only chimney-sweepers of Paris, have learned this art from the marmot, which is bred in the same country.

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* He may easily be made tame ; but he is apt to do a great deal of damage in the corn fields, because he will crop the corn as soon as it begins to ear.
BROOKE'S NAT. HISTORY.

† Buffon, from whence the remainder of this description is taken. N. B. He takes it from Gesner, vol. xvii

These animals eat indiscriminately of whatever is presented to them; flesh, bread, fruits, herbs, roots, pulse, and insects. But they are particularly fond of milk and butter. Although less inclined to petty thefts than the cat, yet they always try to steal into the dairy, where they lap up the milk like a cat, purring all the while like that animal, as an expression of their being pleased. As to the rest, milk is the only liquor they like. They seldom drink water, and refuse wine. When pleased or caressed, they often yelp like puppies; but when irritated or frighted, they have a piercing note that hurts the ear. They are very cleanly animals, and like the cat retire upon necessary occasions; but their bodies have a disagreeable scent, particularly in the heat of summer. This tinctures their flesh, which, being very fat and firm, would be very good, were not this flavour always found to predominate.

We have hitherto been describing affections in this animal which it has in common with many others; but we now come to one which particularly distinguishes it from all others of this kind, and, indeed, from every other quadruped except the bat and the dormouse: this is its sleeping during the winter. The marmot, though a native of the highest mountains, and where the snow is never wholly melted, nevertheless seems to feel the influence of the cold more than any other, and in a manner has all its faculties chilled up in winter. This extraordinary suspension of life and motion for more than half the year, deserves our wonder, and excites our attention to consider the manner of such a temporary death, and the subsequent revival. But first to describe, before we attempt to discuss.

The marmot, usually at the end of September, or the beginning of October, prepares to fit up its habitation for the winter, from which it is never seen to issue till about the beginning or the middle of April. This animal's little retreat is made with great precaution, and fitted up with art. It is a hole on the side of a mountain, extremely deep, with a spacious apartment at the bottom, which is rather longer than it is broad. In this several marmots can reside at the same time, without crowding each other, or injuring the air they breathe. The feet and claws of this animal seem made for digging; and, in fact, they burrow into the ground with amazing facility, scraping up the earth like a rabbit, and throwing back what they have thus loosened behind them. But the form of their hole is still more wonderful; it resembles the letter Y; the two branches being two openings, which conduct into one channel and terminates in their general apartment that lies at the bottom. As the whole is made on the declivity of a mountain, there is no part of it on a level but the apartment at the end. One of the branches or openings issues out, sloping downwards; and this serves as a kind of sink or drain to the whole family, where they make their excrements, and where the moisture of the place is drawn away. The other branch, on the contrary, slopes upwards, and this serves as their door by which to go out and in. The apartment at the end is very warmly stuccoed round with moss and hay, of both which they make an ample provision during the summer. As this is a work of great labour, so it is undertaken in common; some cut the finest grass, others gather it, and others take their turns to drag it into their hole. Upon this occasion, as we are told, one of them lies on its back, permits the hay to be heaped upon its belly, keeps its paws upright to make greater room; and in this manner, lying still on its back, it is dragged by the tail, hay and all, to their common retreat. This also some give as a reason for the hair being generally worn away on their backs, as is usually the case; however, a better reason for this may be assigned, from their continually rooting up holes, and passing through narrow openings. But, be this as it will, certain it is that they all live together, and work in common to make their habitation as snug and convenient as possible. In it they pass three parts of their lives; into it they retire when the storm is high; in it they continue while it rains; there they remain when apprehensive of danger, and never stir out except in fine weather, never going far from home even then. Whenever they venture abroad one is placed as a sentinel, sitting upon a lofty rock, while the rest amuse themselves in playing along the green fields, or are employed in cutting grass and making hay for their winter's convenience. Their trusty sentinel, when an enemy, a man, a dog, or a bird of prey approaches, apprizes its companions with a whistle, upon which they all make home, the sentinel himself bringing up the rear.

But it must not be supposed that this hay is designed for provision; on the contrary, it is always found in as great plenty in their holes at the end as at the beginning of winter; it is only sought for the convenience of their lodging, and the advantages of their young. As to provision, they seem kindly apprised by Nature that during the winter they shall not want any, so that they make no preparations for food, though so diligently employed in fitting up their abode. As soon as they perceive the first approaches of the winter, during which their vital motions are to continue in some measure suspended, they labour very diligently to close up the two entrances of their habitation, which they effect with such solidity, that it is easier to dig up the earth any where else than where they have closed it. At that time they are very fat, and some of them are found to weigh above twenty pounds; they continue so for even three months more; but by degrees their flesh begins to waste, and they are usually very lean by the end of winter. When their retreat is opened the whole family is then discovered, each rolled into a ball, and covered up under the hay. In this state they seem entirely lifeless; they may be taken away, and even killed without their testifying any great pain; and those who find them in this manner, carry them home in order to breed up the young and eat the old ones —

A gradual and gentle warmth revives them; but they would die if too suddenly brought near the fire, or if their juices were too quickly liquified.

Strictly speaking, says Mr. Buffon, these animals cannot be said to sleep during the winter; it may be called rather a *torpor*, a stagnation of all the faculties.* This torpor is produced by the congelation of their blood, which is naturally much colder than that of all other quadrupeds. The usual heat of man and other animals is about thirty degrees above congelation; the heat of these is not above ten degrees. Their internal heat is seldom greater than that of the temperature of the air. This has been often tried by plunging the ball of the thermometer into the body of a living dormouse, and it never rose beyond its usual pitch in air, and sometimes it sunk above a degree. It is not surprising, therefore, that these animals, whose blood is so cold naturally, should become torpid, when the external cold is too powerful for the small quantity of heat in their bodies, yet remaining; and this always happens when the thermometer is not more than ten degrees above congelation. This coldness Mr. Buffon has experienced in the blood of the bat, the dormouse, and the hedge-hog, and with great justice, he extends the analogy to the marmot, which, like the rest, is seen to sleep all the winter. This torpid state continues as long as the cause which produces it continues; and it is very probable that it might be lengthened out beyond its usual term, by artificially prolonging the cold; if, for instance, the animal were rolled up in wool, and placed in a cold cellar, nearly approaching to, but not quite so cold as an ice-house, for that would kill them outright, it would remain perhaps a whole year in its state of insensibility. However this be, if the heat of the air be above ten degrees, these animals are seen to revive; and, if it be continued in that degree of temperature, they do not become torpid, but eat and sleep at proper intervals like all other quadrupeds whatever.

From the above account we may form some conception of the state in which these animals continue during the winter. As in some disorders where the circulation is extremely languid, the appetite is diminished in proportion, so in these the blood scarcely moving, or only moving in the greater vessels, they want no nourishment to repair what is worn away by its motions. They are seen, indeed, by slow degrees to become leaner in proportion to the slow attrition of their fluids; but this is not perceptible, except at the end of some months. Man is often known to gather nourishment from the ambient air; and these also may in some measure be supplied in the same manner; and, having sufficient motion in their fluids to keep them from putrefaction, and just sufficient nourishment to supply the waste of their languid circulation, they continue rather feebly alive than sleeping..

These animals produce but once a year, and usually bring forth but three or four at a time. They grow very fast, and the extent of their lives is not above nine or ten years; so that the species is neither numerous nor very much diffused. They are chiefly found in the Alps where they seem to prefer the brow of the highest mountains to the lowest ranges, and the sunny side to that of the shade. The inhabitants of the country where they chiefly reside, when they observe the hole, generally stay till winter before they think proper to open it; for if they begin too soon, the animal wakes, and as it has a surprising faculty of digging, makes its hole deeper in proportion as they follow. Such as kill it for food, use every art to improve the flesh, which is said to have a wild taste, and to cause vomitings.* They, therefore, take away the fat, which is in great abundance, and salt the remainder, drying it somewhat in the manner of bacon. Still, however, it is said to be very indifferent eating. This animal is found in Poland under the denomination of the *boback*, entirely resembling that of the Alps, except that the latter has a toe more upon its fore-foot than the former. It is found also in Siberia under the name of the *Jevraska*, being rather smaller than either of the other two. Lastly, it is found in Canada by the appellation of the *Monax* differing only from the rest in having a bluish snout and a longer tail.

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* Buffon, vol. xvi. Loirs

THE AGOUTI.

From the marmot, which differs from the hare so much in the length of its fur, we go to the Agouti, another species equally differing in the shortness of its hair. These bear some rude resemblance to the hare and the rabbit in their form and manner of living, but sufficiently differing to require a particular description. The first of these, and that the largest, as was hinted above, is called the *agouti*. This animal is found in great abundance in the southern parts of America, and has by some been called the *rabbit* of that continent. But, though in many respects it resembles the rabbit, yet still in many more it differs, and is, without all doubt, an animal peculiar to the new world only. The agouti is about the size of the rabbit, and has a head very much resembling it, except that the ears are very short in comparison. It resembles the rabbit also in the arched form of its back, in the hind legs being longer than the fore, and in having four great cutting teeth, two above and two below; but then it differs in the nature of its hair, which is not soft and downy as in the rabbit, but hard and bristly like that of a sucking pig, and of a reddish brown colour. It differs also in the tail, which is even shorter than in the rabbit, and entirely destitute of hair. Lastly it differs in the number of its toes, having but three on the hinder feet, whereas the rabbit has five. All these distinctions, however, do not countervail against its general form, which resembles that of a rabbit, and most travellers have called it by that name.

As this animal differs in form, it differs still more in habitudes and disposition. As it has the hair of a hog, so also it has its voraciousness.† It eats indiscriminately of all things; and, when satiated, hides the remainder like the dog or the fox, for a future occasion. It takes a pleasure in gnawing and spoiling every thing it comes near. When irritated, its hair stands erect along the back, and, like the rabbit, it strikes the ground violently with its hind feet. It does not dig a hole in the ground, but burrows in the hollows of trees. Its ordinary fooo consists of the roots of the country, potatoes and yams, and such fruits as fall from the trees in autumn. It uses its forepaws like the squirrel, to carry its food to its mouth : and as its hind feet are longer than the fore, it runs very swiftly upon plain ground or up a hill, but upon a descent it is in danger of falling. Its sight is excellent, and its hearing equals that of any other animal; whenever it is whistled to, it stops to hearken. The flesh of such as are fat and well fed is tolerable food, although it has a peculiar taste, and is a little tough. The French dress it like a sucking pig, as we learn from Mr. Buffon's account; but the English dress it with a pudding in its belly, like a hare. It is hunted by dogs ; and whenever it has got into a sugar ground, where the canes cover the place, it is easily overtaken for it is embarrassed every step it takes, so that a man may easily come up with it, without any other assistance. When in the open country, it usually runs with great swiftness before the dogs until it gains its retreat, within which it continues to hide, and nothing but filling the hole with smoke can force it out. For this purpose, the hunter burns faggots or straw at the entrance, and conducts the smoke in such a manner that it fills the whole cavity. While this is doing the poor little animal seems sensible of its danger, and begs for quarter with a most plaintive cry, seldom quitting its hole till the utmost extremity. At last, when half-suffocated, it issues out, and trusts once more to its speed for protection. When still forced by the dogs, and incapable of making good a retreat, it turns upon the hunters, and with its hair bristling like a hog, and standing upon its hind-feet, it defends itself very obstinately. Sometimes it bites the legs of those that attempt to take it, and will take out the piece wherever it fixes its teeth.*

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* Dictionnaire. Raisonnée, vol. iii p. 29.

† Buffon.

Its cry when disturbed or provoked resembles that of a sucking pig. If taken young, it is easily tamed, continues to play harmlessly about the house, and goes out and returns of its own accord. In a savage state it usually continues in the woods, and the female generally chooses the most obscure parts to bring forth her young. She there prepares a bed of leaves and dry grass, and generally brings forth two at a time. She breeds twice or thrice a-year, and carries her young from one place to another, as convenience requires, in the manner of a cat. She generally lodges them, when three days old, in the hollow of a tree, suckling them but a very short time, for they soon come to perfection, and it should consequently follow that they soon grow old.

THE PACA.

The paca is an animal also of South America, very much resembling the former, and like it has received the name of the *American rabbit*, but with as little propriety It is about the size of a hare, or rather larger, and in figure somewhat like a sucking pig, which it also resembles in its grunting and its manner of eating. It is, however, most like he agouti, although it differs in several particulars. Like the agouti it is covered rather with coarse hair than a downy fur. But then it is beautifully marked along the sides with small ash-coloured spots, upon an amber coloured ground; whereas the agouti is pretty much of one reddish colour. The paca is rather more thick and corpulent than the agouti; its nose is shorter, and its hind-feet have five toes; whereas the agouti has but three. As to the rest, this animal bears some distant resemblance to a rabbit, the ears are naked of hair, and somewhat sharp, the lower jaw is somewhat longer than the upper, the teeth, the shape of the head, and the size of it, are like to those of a rabbit. It has a short tail likewise, though not tufted; and its hinder legs are longer than the fore. It also burrows in the ground, like that animal, and from this similitude alone, travellers might have given it the name.

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* Ray's Synop.

The paca does not make use of its fore-paws, like the squirrel or the agouti, to carry its food to its mouth, but hunts for it on the ground, and roots like a hog. It is generally seen along the banks of rivers, and is only to be found in the most moist and warm countries of South America. It is a very fat animal, and in this respect much preferable to the agouti, that is most commonly found lean. It is eaten skin and all, like a young pig, and is considered as a great delicacy.—Like the former little animal it defends itself to the last extremity, and is very seldom taken alive. It is persecuted not only by man, but by every beast and bird of prey, who all watch its motions, and, if it ventures at any distance from its hole, are sure to seize it. But although the race of these little animals is thus continually destroyed, it finds some refuge in its hole, from the general combination; and breeds in such numbers, that the diminution is not perceptible.

To these animals may be added others, very similar, both in form and disposition; each known by its particular name in its native country, but which travellers have been contented to call rabbits or hares; of which we have but indistinct notice. The TAPETI, or the BRASILIAN RABBIT, is in shape like our English ones, but is much less, being said to be not above twice the size of a dormouse. It is reddish on the forehead, and a little whitish under the throat. It is remarkable for having no tail; but it has long ears and whiskers, like our rabbits, and black eyes. It does not burrow, like ours; but lives at large like the hare.

The APEREA is also called by some the BRASILIAN RABBIT being an animal that seems to partake of the nature of a rabbit and a rat. The ears are like those of a rat, being short and round; but the other parts are like those of a rabbit, except that it has but three toes on the hinder legs like the agouti.

To these imperfect sketches of animals little known, others less known might be added; for as Nature becomes more diminutive, her operations are less attentively regarded. I shall only, therefore, add one animal more to this class, and that very well known; I mean the Guinea-pig; which Brisson places among those of the rabbit kind; and as I do not know any other set of animals with which it can be so well compared, I will take leave to follow his example

THE GUINEA-PIG.

The Guinea-pig is a native of the warmer climates; but has been so long rendered domestic, and so widely diffused, that it has now become common in every part of the world. There are few unacquainted with the figure of this little animal; in some places it is considered as the principal favourite; and is often found even to displace the lap-dog It is less than a rabbit, and its legs are shorter; they are scarce seen, except when it moves; and the neck also is so short, that the head seems stuck upon the shoulders. The ears are short, thin, and transparent; the hair is like that of a sucking-pig, from whence it has taken the name; and it wants even the vestiges of a tail. In other respects, it has some similitude to the rabbit. When it moves, its body lengthens like that animal; and when it is at rest, it gathers up in the same manner. Its nose is formed with the rabbit lip, except that its nostrils are much farther asunder. Like all other animals in a domestic state, its colours are different; some are white, some are red, and others both red and white. It differs from the rabbit in the number of its toes, having four toes on the feet before, and but three on those behind. It strokes its head with the fore-feet, like the rabbit; and, like it, sits upon the hind-feet; for which purpose there is a naked callous skin on the back part of the legs and feet.

These animals are, of all others, the most helpless and inoffensive.* They are scarce possessed of courage sufficient to defend themselves against the meanest of all quadrupeds, a mouse. Their only animosity is exerted against each other; for they will often fight very obstinately; and the stronger is often known to destroy the weaker. But against all other aggressors, their only remedy is patience and non-resistance. How, therefore, these animals, in a savage state, could contrive to protect themselves, I have not been able to learn; as they want strength, swiftness, and even the natural instinct so common to almost every other creature.

As to their manner of living among us, they owe their lives entirely to our unceasing protection. They must be constantly attended, shielded from the excessive colds of the winter, and secured against all other domestic animals which are apt to attack them, from every motive, either of appetite, jealousy, or experience of their pusillanimous nature. Such indeed, is their stupidity, that they suffer themselves to be devoured by the cats without resistance; and, differing from all other creatures, the female sees her young destroyed without once attempting to protect them. Their usual food is bran, parsley, or cabbage-leaves; but there is scarce a vegetable cultivated in our gardens that they will not gladly devour. The carrot-top is a peculiar dainty; as also sallad; and those who would preserve their healths, would do right to vary their food; for if they be continued on a kind too succulent or too dry, the effects are quickly perceived upon their constitutions. When fed upon recent vegetables, they seldom drink. But it often happens that conducted by Nature, they seek drier food, when the former disagrees with them. They then gnaw clothes, paper, or whatever of this kind they meet with; and on these occasions they are seen to drink like most other animals, which they do by lapping. They are chiefly fond of new milk; but in case of necessity, are content with water.

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* This history is partly taken from the Amœnitates Academicæ, vol iv. p. 202

They move pretty much in the manner of rabbits, though not near so swiftly; and when confined in a room, seldom cross the floor, but generally keep along the wall. The male usually drives the female on before him, for they never move a-breast together, but constantly the one seems to tread in the footsteps of the preceding. They chiefly seek for the darkest recesses, and the most intricate retreats; where, if hay be spread as a bed for them, they continue to sleep together, and seldom venture out but when they suppose all interruption removed. On these occasions they act as rabbits; they swiftly move forward from their bed, stop at the entrance, listen, look round, and if they perceive the slightest approach of danger, they run back with precipitation. In very cold weather, however, they are more active, and run about in order to keep themselves warm.

They are a very cleanly animal, and very different from those whose name they go by. If the young ones happen to fall into the dirt, or be any other way discomposed, the female takes such an aversion to them, that she never permits them to visit her more. Indeed, her whole employment, as well as that of the male, seems to consist in smoothing their skins, in disposing their hair, and improving its gloss. The male and female take this office by turns; and when they have thus brushed up each other, they then bestow all their concern upon their young, taking particular care to make their hair lie smooth, and biting them if they appear refractory. As they are so solicitous for elegance themselves, the place where they are kept must be regularly cleaned, and a new bed of hay provided for them at least every week. Being natives of a warm climate, they are naturally chilly in ours; cleanliness, therefore, assists warmth, and expels moisture. They may be thus reared, without the aid of any artificial heat; but, in general, there is no keeping them from the fire in winter, if they be once permitted to approach it.

When they go to sleep, they lie flat on their bellies, pretty much in their usual posture; except that they love to have their fore-feet higher than their hinder. For this purpose they turn themselves several times round before they lie down, to find the most convenient situation. They sleep like the hare, with their eyes half open; and continue extremely watchful, if they suspect danger. The male and female are never seen both asleep at the same time; but while he enjoys his repose, she remains upon the watch, silently continuing to guard him, and her head turned towards the place where he lies.—

When she supposes that he has had his turn, she then awakes him with a kind of murmuring noise, goes to him, forces him from his bed, and lies down in his place. He then performs the same good turn for her, and continues watchful till she also has done sleeping.

These animals are exceedingly salacious, and generally are capable of coupling at six weeks old. The female never goes with young bove five weeks; and usually brings forth from three to five at a time; and this not without pain. But what is very extraordinary, the female admits the male the very day she has brought forth, and becomes again pregnant; so that their multiplication is astonishing. She suckles her young but about twelve or fifteen days; and during that time does not seem to know her own; for if the young of any other be brought, though much older, she never drives them away but suffers them even to drain her, to the disadvantage of her own immediate offspring. They are produced with the eyes open, like all others of the hare kind; and in about twelve hours, equal even to the dam in agility. Although the dam has but two teats, yet she abundantly supplies them with milk; and they are also capable of feeding upon vegetables, almost from the very beginning. If the young ones are permitted to continue together, the stronger, as in all other societies, soon begins to govern the weak. Their contentions are often long and obstinate; and their jealousies very apparent. Their disputes are usually for the warmest place, or the most agreeable food. If one of them happens to be more fortunate in this respect than the rest, the strongest generally comes to dispossess it of its advantageous situation. Their manner of fighting, though terrible to them, is ridiculous enough to a spectator. One of them seizes the hair on the nape of the other's neck with its fore teeth, and attempts to tear it away; the other, to retaliate, turns its hinder parts to the enemy, and kicks up behind like a horse, and with its hinder claws scratches the sides of its adversary; so that sometimes they cover each other with blood. When they contend in this manner, they gnash their teeth pretty loudly, and this is often a denunciation of mutual resentment.

These, though so formidable to each other, yet are the most timorous creatures upon earth, with respect to the rest of Animated Nature: a falling leaf disturbs them, and every animal overcomes them. From hence they are difficultly tamed; and will suffer none to approach them, except the person by whom they are fed. Their manner of eating is something like that of a rabbit; and, like it, they appear also to chew the cud. Although they seldom drink, they make water every minute. They grunt somewhat like a young pig; and have a more piercing note to express pain. In a word, they do no injury; but then, except the pleasure they afford the spectator, they are of very little benefit to mankind. Some, indeed, dress and eat them; but their flesh is indifferent food, and by no means a reward for the trouble of rearing them. This, perhaps, might be improved, by keeping them in a proper warren, and not suffering them to become domestic; however, the advantages that would result from this, would be few, and the trouble great; so that it is likely they would continue an useless, inoffensive dependant, rather propagated to satisfy caprice than to supply necessity.

BOOK VI.

ANIMALS OF THE RAT, HEDGEHOG, &c. KINDS

CHAPTER I

THE RAT KIND.

WERE it necessary to distinguish animals of the rat kind from all others, we might describe them as having two large cutting teeth, like the hare kind, in each jaw; as covered with hair; and as not ruminating. These distinctions might serve to guide us, had we not too near an acquaintance with this noxious race to be mistaken in their kind. Their numbers, their minuteness, their vicinity, their vast multiplication, all sufficiently contribute to press them upon our observation, and remind us of their existence. Indeed, if we look through the different ranks of animals, from the largest to the smallest, from the great elephant to the diminutive mouse, we shall find that we suffer greater injuries from the contemptible meanness of the one, than the formidable invasions of the other. Against the elephant, the rhinoceros, or the lion, we can oppose united strength ; and by art make up the deficiencies of natural power: these we have driven into their native solitudes, and obliged to continue at a distance, in the most inconvenient regions and unhealthful climates. But it is otherwise with the little teasing race I am now describing ; no force can be exerted against their unresisting timidity ; no arts can diminish their amazing propagation ; millions may be at once destroyed, and yet the breach be repaired in the space of a very few weeks ; and, in proportion as Nature has denied them force, it has supplied the defect by their fecundity

THE GREAT RAT.

The animal best known at present, and in every respect the most mischievous is the GREAT RAT; which, though but a new comer into this country, has taken too secure a possession to be ever removed. This hateful and rapacious creature, though sometimes called the *rat of Norway*, is utterly unknown in all the northern countries, and, by the best accounts I can learn, comes originally from the Levant. Its first

Rat, p. 212.

Marmot (Parry's), p. 192.

Agouti, p. 196.

Hamster, p. 209.

To face p. 213, vol. ii.

arrival, as I am assured, was upon the coasts of Ireland, in those ships that traded in provisions to Gibraltar; and perhaps we owe to a single pair of these animals, the numerous progeny that now infest the whole extent of the British Empire.

This animal, which is called by Mr. Buffon, the *surmalot*, is in length about nine inches; its eyes are large and black; the colour of the head, and the whole upper part of the body, is of a light brown, mixed with a tawny and ash colour. The end of the nose, the throat, and belly, are of a dirty white, inclining to grey; the feet and legs are almost bare, and of a dirty pale flesh colour; the tail is as long as the body, covered with minute dusky scales mixed with a few hairs, and adds to the general deformity of its detestable figure. It is chiefly in the colour that this animal differs from the *black rat*, or the *common rat*, as it was once called; but now common no longer. This new invader, in a very few years after its arrival, found means to destroy almost the whole species, and to possess itself of their retreats.

But it was not against the black rat alone that its rapacity was directed; all other animals of inferior strength shared the same misfortunes. The contest with the black rat was of short continuance. As it was unable to contend, and had no holes to fly to for retreat, but where its voracious enemy could pursue. The whole race was soon extinguished. The frog also was an animal equally incapable of combat or defence. It had been designedly introduced into the kingdom of Ireland some years before the Norway rat; and it was seen to multiply amazingly. The inhabitants were pleased with the propagation of a harmless animal, that served to rid their fields of insects; and even the prejudices of the people were in its favour, as they supposed that the frog contributed to render their waters more wholesome. But the Norway rat soon put a stop to their increase; as these animals were of an amphibious nature, they pursued the frog to its lakes, and took it even in its own natural element. I am, therefore, assured, that the frog is once more almost extinct in that kingdom; and that the Norway rat, having no more enemies left there to destroy, is grown less numerous also.

We are not likely, therefore to gain by the destruction of our old domestics, since they are replaced by such mischievous successors.—The Norway rat has the same disposition to injure us, with much greater power of mischief. It burrows in the banks of rivers, ponds, and ditches; and is every year known to do incredible damage to those mounds that are raised to conduct streams, or to prevent rivers from overflowing. In these holes which it forms pretty near the edge of the water, it chiefly resides during the summer, where it lives upon small animals, fish, and corn. At the approach of winter, it comes nearer the farm houses; burrows in their corn, eats much, and damages still more than it consumes. But nothing that can be eaten seems to escape its voracity. It destroys rabbits, poultry, and all kinds of game; and, like the polecat, kills much more than it can carry away It swims with great ease, dives with great celerity, and easily thins the fish-pond. In short, scarce any of the feebler animals escape its rapacity, except the mouse, which shelters itself in its little hole, where the Norway rat is too big to follow.

These animals frequently produce from fifteen to thirty at a time;* and usually bring forth three times a year. This great increase would quickly be found to overrun the whole country, and render our assiduity to destroy them fruitless, were it not, happily for us, that they eat and destroy each other. The same insatiable appetite that impels them to indiscriminate carnage, also incites the strongest to devour the weakest, even of their own kind. The large male rat generally keeps in a hole by itself, and is dreaded by its own species as the most formidable enemy. In this manner the number of these vermin is kept within due bounds; and when their increase becomes injurious to us, it is repressed by their own rapacity.

But besides their own enmities among each other, all the stronger carnivorous quadrupeds have natural antipathies against them. The dog, though he detests their flesh, yet openly declares his alacrity to pursue them; and attacks them with great animosity. Such as are trained up to killing these vermin, despatch them often with a single squeeze: but those dogs that show any hesitation are sure to come off but indifferently; for the rat always takes the advantage of a moment's delay, and instead of waiting for the attack, becomes the aggressor, seizing its pursuer by the lip, and inflicting a very painful and dangerous wound. From the inflammation, and other angry symptoms that attend this animal's bite, some have been led to think that it was in some measure venomous; but it is likely that the difficulty of the wound's healing, arises merely from its being deep and lacerated by the teeth, and is rather a consequence of the figure of the instruments that inflict it, than any venom they may be supposed to possess.

The cat is another formidable enemy of this kind; and yet the generality of our cats neither care to attack it, nor to feed upon it when killed. The cat is a more prudent hunter than the dog, and will not be at the pains to take or combat with an enemy that is not likely to repay her time and danger. Some cats, however, will pursue and take the rat; though often not without an obstinate resistance. If hungry, the cat will sometimes eat the head; but, in general, she is merely content with her victory.

A foe much more dangerous to these vermin is the weasel. This animal pursues them with avidity, and being pretty nearly of their own size, follows them into their holes, where a desperate combat ensues. The strength of each is pretty near equal; but the arms are very different. The rat, furnished with four long tusks at the extremity of its jaw, rather snaps than bites; but the weasel, where it once fastens, holds, and continuing also to suck the blood at the same time, weakens its antagonist, and always obtains the victory. Mankind have contrived several other methods of destroying these noxious intruders; ferrets, traps, and particularly poison; but of all other poisons, I am told that the nux vomica, ground and mixed with meal is the most certain, as it is the least dangerous.

To this species, I will subjoin as a variety, the BLACK RAT, mentioned above, greatly resembling the former in figure, but very distinct in Nature, as appears from their mutual antipathy. This animal was

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*Buffon, vol. xvii. p. 2.

Guinea Pig, p. 199.

Badger, p. 15, vol. iii.

Gerbua, p. 23, vol. iii.

Water Rat, p. 205.

Field, or Harvest Mouse, p. 206

To face p. 205, vol. ii.

formerly as mischievous as it was common; but at present it is almost utterly extirpated by the great rat, one malady often expelling another It is becoming so scarce, that I do not remember ever to have seen one. It is said to be possessed of all the voracious and unnatural appetites of the former; though, as it is less, they may probably be less noxious. Its length is about seven inches; and its tail is nearly eight inches long. The colour of the body is of a deep iron grey, bordering upon black, except the belly, which is of a dirty cinereous hue. They have propagated in America in great numbers, being originally introduced from Europe; and as they seem to keep their ground wherever they get footing, they are now become the most noxious animals in that part of the world.

To this also we may subjoin the Black Water Rat, about the same size with the latter, with a larger head, a blunter nose, less eyes, shorter ears, and the tip of its tail a little white. It was supposed by Ray to be web-footed; but this has been found to be a mistake, its toes pretty much resembling those of its kind. It never frequents houses; but is usually found on the banks of rivers, ditches, and ponds, where it burrows and breeds. It feeds on fish, frogs, and insects; and in some countries it is eat on fasting days.

THE MOUSE.

An animal equally mischievous, and equally well known with the former, is the mouse. Timid, cautious, and active, all its dispositions are similar to those of the rat, except with fewer powers of doing mischief.* Fearful by nature, but familiar from necessity, it attends upon mankind, and comes an unbidden guest to his most delicate entertainments. Fear and necessity seem to regulate all its motions; it never leaves its hole but to seek provision, and seldom ventures above a few paces from home. Different from the rat, it does not go from one house to another, unless it be forced; and as it is more easily satisfied, it does much less mischief.

Almost all animals are tamed more difficultly in proportion to the cowardice of their natures. The truly bold and courageous easily become familiar, but those that are always fearful are ever suspicious The mouse being the most feeble, and consequently the most timid of all quadrupeds, except the Guinea-pig, is never rendered thoroughly familiar; and, even though fed in a cage, retains its natural apprehensions. In fact, it is to these alone that it owes its security.† No animal has more enemies, and few so incapable of resistance. The owl, the cat, the snake, the hawk, the weasel, the rat itself, destroys this species by millions, and it only subsists by its amazing fecundity

The mouse brings forth at all seasons, and several times in a year Its usual number is from six to ten. These, in less than a fortnight are strong enough to run about and shift for themselves. They are chiefly found in farmers' yards, and among their corn, but are seldom in those ricks that are much infested with rats. They generally choose the south west side of the rick, from whence most rain is expected; and from thence they often, of an evening, venture forth to drink the little drops either of rain or dew that hang at the extremities of the straw.* Aristotle gives us an idea of their prodigious fecundity, by assuring us, that having put a mouse with young into a vessel of corn, in some time after he found a hundred and twenty mice, all sprung from one original. The early growth of this animal implies also the short duration of its life, which seldom lasts above two or three years. This species is very much diffused, being found in almost all parts of the ancient continent, and having been exported to the new.† They are animals that, while they fear human society, closely attend it; and, although enemies to man, are never found but near those places where he has fixed his habitation. Numberless ways have been found for destroying them; and Gesner has minutely described the variety of traps by which they are taken. Our Society for the Encouragement of Arts and Manufactures proposed a reward for the most ingenious contrivance for that purpose; and I observed almost every candidate passing off descriptions as inventions of his own. I thought it was cruel to detect the plagiarism, or frustrate the humble ambition of those who would be thought the inventors of a mouse-trap.

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* Buffon, vol. xv. p. 145.

† E volucribus hirundines sunt indociles, e terrestribus mures. Plin

To this species, merely to avoid teazing the reader with a minute description of animals very inconsiderable and very nearly alike, I will add that of the LONG-TAILED FIELD MOUSE, which is larger than the former, of a colour very nearly resmbling the Norway rat, and chiefly found in fields and gardens. They are extremely voracious, and hurtful in gardens and young nurseries, where they are killed in great numbers. However, their fecundity quickly repairs the destruction.

Nearly resembling the former, but larger, (for it is six inches long) is the SHORT-TAILED FIELD MOUSE; which, as the name implies, has the tail much shorter than the former, it being not above an inch and a half long, and ending in a small tuft. Its colour is more inclining to that of the domestic mouse, the upper part being blackish, and the under of an ash-colour. This, as well as the former are remarkable for laying up provision against winter; and Mr. Buffon assures us they sometimes have a store of above a bushel at a time.

We may add also the SHREW-MOUSE to this species of minute animals, being about the size of the domestic mouse, but differing greatly from it in the form of its nose, which is very long and slender. The teeth also are of a very singular form, and twenty-eight in number; whereas the common number in the rat kind, is usually not above sixteen. The two upper fore-teeth are very sharp, and on each side of them there is a kind of wing or beard, like that of an arrow, scarce visible but on a close inspection. The other teeth are placed close together, being very small and seeming scarce separated; so that with respect to this part of its formation, the animal has some resemblance to the viper.—However, it is a very harmless little creature, doing scarce any injury

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* Buffon, vol. xv. p. 147.

† Lisle's Husbandry, vol. ii. p. 391

On the contrary, as it lives chiefly in the fields, and feeds more upon insects than corn, it may be considered rather as a friend than an enemy. It has a strong, disagreeable smell, so that the cat when it is killed, will refuse to eat it. It is said to bring four or five young at a time.

THE DORMOUSE.

These animals may be distinguished into three kinds; the GREATER DORMOUSE, which Mr. Buffon calls the LOIR; the MIDDLE, which he calls the LEROT; the LESS, which he denominates the MUSCARDIN. They differ from each other in size, the largest being equal to a rat, the least being no bigger than a mouse. They all differ from the rat in having the tail tufted with hair, in the manner of a squirrel, except that the squirrel's tail is flat, resembling a fan; and theirs round, resembling a brush. The lerot differs from the loir by having two black spots near the eyes; the muscardin differs from both in the whitish colour of its hair on the back. They all three agree in having black sparkling eyes, and the whiskers partly white and partly black. They agree in their being stupefied, like the marmot, during the winter, and in their hoarding up provisions to serve them in case of a temporary revival.

They inhabit the woods or very thick hedges, forming their nests in the hollow of some tree or near the bottom of a close shrub, humbly content with continuing at the bottom and never aspiring to sport among the branches. Towards the approach of the cold season, they form a little magazine of nuts, beans, or acorns; and having laid in their hoard, shut themselves up with it for the winter. As soon as they feeel the first advances of the cold, they prepare to lessen its effect, by rolling themselves up in a ball, and thus exposing the smallest surface to the weather. But it often happens that the warmth of a sunny day, or an accidental change from cold to heat, thaws their nearly stagnant fluids, and they revive. On such occasions they have their provisions laid in, and they have not far to seek for their support. In this manner they continue usually asleep, but sometimes waking, for about five months in the year, seldom venturing from their re treats, and, consequently, but rarely seen. Their nests are lined with moss, grass, and dead leaves; they usually bring forth three or four young at a time, and that but once a-year, in the spring.

THE MUSK RAT.

Of these animals of the rat kind, but with a musky smell, there are also three distinctions, as of the former; the ONDATRA, the DESMAN, and the PILORI. The ondatra is a native of Canada, the desman of Lapland, and the pilori of the West-India islands. The ondatra differs from all others of its kind, in having the tail flatted and carried edge-ways. The desman has a long extended snout, like the shrew-mouse; and the pilori a short tail as thick at one end as the other

They all resemble each other in being fond of the water, but particularly in that musky odour from whence they have taken their name.

Of these the **ONDATRA** is the most remarkable, and has been the most minutely described.* This animal is about the size of a small rabbit, but has the hair, the colour, and the tail of a rat, except that it is flatted on the sides, as mentioned above. But it is still more extraordinary upon other accounts, and different from all other animals whatever. It is so formed that it can contract and enlarge its body at pleasure. It has a muscle like that of horses, by which they move their hides, lying immediately under the skin, and that furnished with such a power of contraction, together with such an elasticity in the false ribs, that this animal can creep into a hole where others, seemingly much less, cannot follow. The female is remarkable also for two distinct apertures, one for urine, the other for propagation. The male is equally observable for a peculiarity of conformation ; the musky smell is much stronger at one particular season of the year than any other ; and the marks of the sex seem to appear and disappear in the same manner.

The ondatra in some measure resembles the beaver in its nature and disposition. They both live in society during winter ; they both form houses of two feet and a half wide, in which they reside, several families together. In these they do not assemble to sleep as the marmot, but purely to shelter themselves from the rigour of the season. However they do not lay up magazines of provision like the beaver : they only form a kind of covert-way to and round their dwelling, from whence they issue to procure water and roots, upon which they subsist. During winter their houses are covered under a depth of eight or ten feet of snow ; so that they must lead but a cold, gloomy, and necessitous life, during its continuance. During summer they separate two by two, and feed upon the variety of roots and vegetables that the season offers. They then become extremely fat, and are much sought after, as well for their flesh as their skins, which are very valuable. They then also acquire a very strong scent of musk, so pleasing to an European, but which the savages of Canada cannot abide. What we admire as a perfume, they consider as a most abominable stench, and call one of their rivers on the banks of which this animal is seen to burrow in numbers by the name of the *stinking river* ; as well as the rat itself, which is denominated by them the *stinkard.* This is a strange diversity among mankind ; and perhaps may be ascribed to the different kinds of food among different nations. Such as chiefly feed upon rancid oils, and putrid flesh, will often mistake the nature of scents ; and, having been long used to ill smells, will, by habit consider them as perfumes. Be this as it will, although these nations of northern savages consider the musk rat as intolerably fœtid, they nevertheless regard it as very good eating, and, indeed, in this they imitate the epicures of Europe very exactly, whose taste seldom relishes a dish till the nose gives the strongest marks of disapprobation. As to the rest, this animal a good deal resembles the beaver in its habits and disposition ; but, as its instincts are less powerful, and its economy less exact, I will reserve for the description of that animal a part of what may be applicable to this

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* Buffon, vol. xx. p. 4.

THE CRICETUS.

The Cricetus, or German Rat, which Mr. Buffon calls the *hamster*, greatly resembles the water rat in its size, small eyes, and the shortness of its tail. It differs in colour, being rather browner, like the Norway rat, with the belly and legs of a dirty yellow. But the marks by which it may be distinguished from all others are two pouches, like those of a baboon, on each side of its jaw, under the skin, into which it can cram a large quantity of provision. These bags are oblong, and of the size, when filled, of a large walnut. They open into the mouth, and fall back along the neck to the shoulder. Into these the animal can thrust the surplus of those fruits or grains it gathers in the fields, such as wheat, peas, or acorns. When the immediate calls of hunger are satisfied, it then falls to filling these ; and thus loaded with two great bunches on each side of the jaw it returns home to its hole to deposit the spoil as a store for the winter. The size, the fecundity, and the voraciousness of this animal render it one of the greatest pests in the countries where it is found, and every method is made use of to destroy it.

But although this animal is very noxious with respect to man, yet, considered with regard to those instincts which conduce to its own support and convenience, it deserves our admiration.* Its hole offers a very curious object for contemplation, and shows a degree of skill superior to the rest of the rat kind. It consists of a variety of apartments, fitted up for the different occasions of the little inhabitant. It is generally made on an inclining ground, and always has two entrances, one perpendicular and the other oblique ; though, if there be more than one in a family, there are as many perpendicular holes as there are individuals below. The perpendicular hole is usually that through which they go in and out : the oblique serves to give a thorough air to keep the retreat clean, and in case one hole is stopped, to give an exit at this. Within about a foot of the perpendicular hole, the animal makes two more, where are deposited the family's provisions. These are much more spacious than the former, and are large in proportion to the quantity of the store. Beside these, there is still another apartment warmly lined with grass and straw, where the female brings forth her young ; all these communicate with each other, and all together take up a space of ten or twelve feet in diameter. These animals furnish their store-houses with dry corn, well cleaned ; they also lay in corn in the ear, and beans and peas in the pod. These, when occasion requires, they afterwards separate, carrying out the pods and empty ears by their oblique passage. They usually begin to lay in at the latter end of August ; and, as each magazine is filled, they carefully cover up the mouth with earth, and that so neatly that it is no easy matter to discover where the earth has been removed. The only means of find ing out their retreats are, therefore, to observe the oblique entrance, which generally has a small quantity of earth before it; and this, though often several yards from their perpendicular retreat, leads those who are skilled in the search to make the discovery. Many German peasants are known to make a livelihood by finding out and bringing off their hoards, which, in a fruitful season, often furnish two bushels of good grain in each apartment

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* Buffon, vol. xxvi. p. 159

Like most others of the rat kind, they produce twice or thrice a year, and bring five or six at a time. Some years they appear in alarming numbers, at other times they are not so plentiful. The moist seasons assist their propagation; and it often happens on such years that their devastations produce a famine all over the country. Happily however, for mankind, these, like the rest of their kind, destroy each other; and of two that Mr. Buffon kept in a cage, male and female, the latter killed and devoured the former. As to the rest, their fur is considered as very valuable; the natives are invited by rewards to destroy them; and the weasel kind seconds the wishes of government with great success. Although they are usually found brown on the back and white on the belly, yet many of them are observed to be gray, which may probably arise from the difference of age.

THE LEMING.

Having considered various kinds of these noxious little animals that elude the indignation of mankind, and subsist by their number, not their strength, we come to a species more bold, more dangerous, and more numerous than any of the former. The leming which is a native of Scandinavia, is often seen to pour down in myriads from the northern mountains, and, like a pestilence, destroys all the productions of the earth. It is described as being larger than a dormouse, with a bushy tail, though shorter. It is covered with thin hair of various colours. The extremity of the upper part of the head is black, as are likewise the neck and shoulders, but the rest of the body is reddish, intermixed with small black spots of various figures, as far as the tail, which is not above half an inch long. The eyes are little and black, the ears round and inclining towards the back, the legs before are short, and those behind are longer, which gives it a great degree of swiftness. But what it is much more remarkable for than its figure are, its amazing fecundity and extraordinary migrations.

In wet seasons, all of the rat kind are known to propagate more than in dry · but this species in particular is so assisted in multiplying by the moisture of the weather, that the inhabitants of Lapland sincerely believe that they drop from the clouds, and that the same magazines that furnish hail and snow pour the Leming also upon them. In fact, after long rain, these animals set forward from their native mountains, and several millions in a troop deluge the whole plain with their numbers.* They move, for the most part, in a square, marching forward by night and lying still by day. Thus, like an animated torrent, they are often seen more than a mile broad covering the ground, and that so thick that the hind-most touches its leader. It is in vain that the poor inhabitant resists or attempts to stop their progress, they still keep moving forward, and though thousands are destroyed, myriads are seen to succeed and make their destruction impracticable. They generally move in lines, which are about three feet from each other, and exactly parallel. Their march is always directed from the north-west to the south-east, and regularly conducted from the beginning Wherever their motions are turned, nothing can stop them ; they go directly forward, impelled by some strange power ; and, from the time they first set out they never once think of retreating. If a lake or a river happens to interrupt their progress, they all together take the water and swim over it ; a fire, a deep well, or a torrent, does not turn them out of their straight-lined direction ; they boldly plunge into the flames, or leap down the well, and are sometimes seen climbing up on the other side. If they are interrupted by a boat across a river while they are swimming, they never attempt to swim round it, but mount directly up its sides ; and the boatmen who know how vain resistance in such a case would be, calmly suffer the living torrent to pass over, which it does without further damage. If they meet with a stack of hay or corn that interrupts their passage, instead of going over it, they gnaw their way through ; if they are stopped by a house in their course, if they cannot go through it, they continue there till they die. It is happy, however, for mankind that they eat nothing that is prepared for human subsistence ; they never enter a house, to destroy the provisions but are contented with eating every root and vegetable that they meet. If they happen to pass through a meadow, they destroy it in a very short time, and give it an appearance of being burnt up and strewed with ashes. If they are interrupted in their course, and a man should imprudently venture to attack one of them, the little animal is no way intimidated by the disparity of strength, but furiously flies up at its opponent, and barking somewhat like a puppy, wherever it fastens does not easily quit the hold. If at last the leader be forced out of its line, which it defends as long as it can, and be separated from the rest of its kind, it sets up a plaintive cry different from that of anger, and, as some pretend to say, gives itself a voluntary death, by hanging itself on the fork of a tree.

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* Phil. Trans. vol. ii. p. 872.

An enemy so numerous and destructive would quickly render the countries where they appear utterly uninhabitable, did it not fortunately happen that the same rapacity that animates them to destroy the labours of mankind, at last impels them to destroy and devour each other.* After committing incredible devastations, they are at last seen to separate into two armies, opposed with deadly hatred, along the coast of the larger lakes and rivers. The Laplanders, who observe them thus drawn up to fight, instead of considering their mutual animosity as a happy riddance, of the most dreadful pest, form ominous prognostics from the manner of their arrangement. They consider their combats as a presage of war, and expect an invasion from the Russians or the Swedes, as the sides next those kingdoms happen to conquer. The two divisions, however, continue their engagements and animosity until one party overcomes the other. From that time they utterly disappear, nor is it well known what becomes of either the conquerors or the conquered. Some suppose that they rush head long into the sea, others that they kill themselves, as some are found hanging on the forked branches of a tree, and others still that they are destroyed by the young spring herbage. But the most probable opinion is, that having devoured the vegetable productions of the country, and having nothing more to subsist on, they then fall to devouring each other; and, having habituated themselves to that kind of food, continue it. However this be, they are often found dead by thousands, and theircarcasseshave been known to infect the air for several miles round, so as to produce very malignant disorders. They seem also to infect the plants they have gnawed, for the cattle often die that afterwards feed in the places where they passed.

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* Dictionnaire Raisonnée, vol. ii. p 610

As to the rest, the male is larger and more beautifully spotted than the female. They are extremely prolific; and, what is very extraordinary, their breeding does not hinder their march; for some of them have been observed to carry one young one in their mouth, and another on their back. They are greatly preyed upon by the ermine and as we are told, even by the rein-deer. The Swedes and Norwegians, who live by husbandry, consider an invasion by these vermin as a terrible visitation; but it is very different with respect to the Laplanders, who lead a vagrant life, and who, like the lemings themselves, if their provisions be destroyed in one part of the country, can easily retire to another. These are never so happy as when an army of lemings come down amongst them; for then they feast upon their flesh; which, though horrid food, and which, though even cats and dogs are known to detest, these little savages esteem very good eating, and devour greedily. They are glad of their arrival also upon another account, for they always expect a great plenty of game the year following, among those fields which the lemings have destroyed.

THE MOLE.

To these minute animals of the rat kind, a great part of whose lives is past in holes under-ground, I will subjoin one little animal more, no way resembling the rat except that its whole life is spent there. As we have seen some quadrupeds formed to crop the surface of the fields, and others to live in the tops of trees, so the mole is formed to live wholly under the earth, as if Nature meant that no place should be left wholly untenanted. Were we from our own sensations to pronounce upon the life of a quadruped that was never to appear above ground, but was always condemned to hunt for its prey underneath, obliged, whenever it removed from one place to another, to bore its way through a resisting body, we should be apt to assert that such an existence must be the most frightful and solitary in nature. However, in the present animal, though we find it condemned to all those seeming inconveniences, we shall discover no signs of wretchedness or distress. No quadruped is fatter, none has a more sleek or glossy skin; and, though denied many advantages that most animals enjoy, it is most liberally possessed of others, which they have in a more scanty proportion

This animal, so well known in England, is, however, utterly a stranger in other places, and particularly in Ireland. For such, therefore, as have never seen it, a short description will be necessary. And, in the first place, though somewhat of a size between the rat and the mouse, it no way resembles either, being an animal entirely of a singular kind, and perfectly unlike any other quadruped whatever. It is bigger than a mouse, with a coat of fine, short, glossy, black hair. Its nose is long and pointed, resembling that of a hog, but much longer. Its eyes are so small, that it is scarce possible to discern them. Instead of ears, it has only holes in the place. Its neck is so short that the head seems stuck upon the shoulders. The body is thick and round, terminating by a very small short tail, and its legs also are so very short that the animal seems to lie flat on its belly. From under its belly, as it rests in this position, the four feet appear just as if they immediately grew out of the body. Thus the animal appears to us at first view as a mass of flesh covered with a fine, shining, black skin, with a little head, and scarce any legs, eyes, or tail. On a close inspection, however, two little black points may be discerned, that are its eyes. The ancients, and some of the moderns, were of opinion that the animal was utterly blind; but Derham, by the help of a microscope, plainly discovered all the parts of the eye that are known in other animals, such as the pupil, the vitreous and crystalline humours. The fore-legs appear very short and strong, and furnished with five claws to each. These are turned outwards and backwards, as the hands of a man when swimming. The hind-legs are longer and weaker than the fore, being only used to assist its motions; whereas the others are continually employed in digging. The teeth are like those of a shrew-mouse, and there are five on both sides of the upper-jaw, which stand out; but those behind are divided into points. The tongue is as large as the mouth will hold.

Such is the extraordinary figure and formation of this animal; which, if we compare with its manner of living, we shall find a manifest attention in Nature to adapt the one to the other.* As it is allotted a subterraneous abode, the seeming defects of its formation vanish, or rather are turned to its advantage. The breadth, strength, and shortness of the fore-feet, which are inclined outwards, answer the purposes of digging, serving to throw back the earth with greater ease, and to pursue the worms and insects which are its prey: had they been longer, the falling in of the earth would have prevented the quick repetition of its strokes in working; or have obliged it to make a large hole in order to give room for their exertion. The form of the body is not less admirably contrived for its way of life. The fore-part is thick, and very muscular, giving great strength to the action of the fore-feet, enabling it to dig its way with amazing force and rapidity either to pursue its prey, or elude the search of the most active enemy. By its power of boring the earth, it quickly gets below the surface; and have seen it, when let loose in the midst of a field, like the ghost on the theatre, instantly sink into the earth; and the most active labourer with a spade, in vain attempted to pursue.

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* British Zoology.

The smallness of its eyes, which induced the ancients to think it was blind, is, to this animal, a peculair advantage. A small degree of vision is sufficient for a creature that is ever destined to live in darkness. A more extensive sight would only have served to show the horrors of its prison, while nature had denied it the means of an escape. Had this organ been larger, it would have been perpetually liable to injuries, by the falling of the earth into it; but Nature, to prevent that inconvenience, has not only made them very small, but very closely covered them with hair. Anatomists mention, besides these advantages, another that contributes to their security, namely, a certain muscle, by which the animal can draw back the eye whenever it is necessary or in danger.

As the eye is thus perfectly fitted to the animal's situation, so also are the senses of hearing and smelling. The first gives it notice of the most distant appearance of danger; the other directs it, in the midst of darkness, to its food. The wants of a subterraneous animal can be but few: and these are sufficient to supply them: to eat, and to produce its kind, are the whole employment of such a life; and for both these purposes it is wonderfully adapted by Nature.*

Thus admirably is this animal fitted for a life of darkness and solitude; with no appetites but what it can easily indulge, with no enemies but what it can easily evade or conquer. As soon as it has once buried itself in the earth, it seldom stirs out, unless forced by violent rains in summer, or when in pursuit of its prey, it happens to come too near the surface, and thus gets into the open air, which may be considered as its unnatural element. In general, it chooses the looser, softer grounds, beneath which it can travel with greater ease; in such also, it generally finds the greatest number of worms and insects, upon which it chiefly preys. It is observed to be the most active, and to cast up most earth, immediately before rain; and, in winter, before a thaw: at those times the worms and insects begin to be in motion: and approach the surface, whither this industrious animal pursues them. On the contrary, in very dry weather, the mole seldom or never forms any hillocks; for then it is obliged to penetrate deeper after its prey, which at such seasons retire far into the ground.

As the moles very seldom come above ground,† they have few enemies; and very readily evade the pursuit of animals stronger and swifter than themselves. Their greatest calamity is an inundation; which, whenever it happens, they are seen in numbers attempting to save themselves by swimming, and using every effort to reach the

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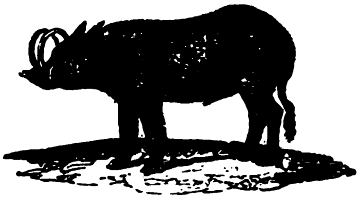
* Testes habet maximos, parastatas amplissimas, novum corpus seminale ab his diversum ac separatum. Penem etiam facile omnium, in fallor, animalium longissimum, ex quibus colligere est maximam præ reliquis omnibus animalibus voluptatem in coitu, hoc abjectum et vile animalculum percipere ut habeant quod ipsi invideant qui in hoc supremas vitæ suæ delicias collocant: Raii Synops. Quadrup. p. 239. Huic opinioni assentitur D. Buffon, attamen non mihi apparet magnitudinem partium talem voluptatem augere. Maribus enim salacissimis contrarium obtinet.

† Buffon.

Phalanger, or Surinam Rat, p. 272.



Babyroussa, p. 97.

Hedgehog, p. 214.

To face p. 215, vol. ii.

higher grounds. The greatest part, however, perish, as well as their young, which remain in the holes behind. Were it not for such accidents, from their great fecundity, they would become extremely troublesome; and, as it is, in some places, they are considered by the farmer as his greatest pest. They couple towards the approach of spring, and their young are found about the beginning of May. They generally have four or five at a time; and it is easy to distinguish among other mole-hills, that in which the female has brought forth her young.—These are made with much greater art than the rest; and are usually larger. The female, in order to form this retreat, begins by erecting the earth into a tolerably spacious apartment, which is supported within by partitions, at proper distances, that prevent the roof from falling. All round this she works, and beats the earth very firm, so as to make it capable of keeping out the rain, let it be never so violent. As the hillock, in which this apartment is thus formed, is raised above ground, the apartment itself is consequently above the level of the plain, and, therefore, less subject to accidental slight inundations. The place being thus fitted, she then procures grass and dry leaves as a bed for her young. There they lie secure from wet, and she continues to make their retreat equally so from danger; for all round this hill of her own raising, are holes running into the earth, that part from the middle apartment, like rays from a centre, and extend about fifteen feet in every direction: these resemble so many walks or chases, into which the animal makes her subterraneous excursions, and supplies her young with such roots or insects as she can provide: but they contribute still more to the general safety; for, as the mole is very quick of hearing, the instant she perceives her little habitation attacked, she takes to her burrow, and unless the earth be dug away by several men at once, she and her young always make a good retreat.

The mole is scarcely found, except in cultivated countries: the varieties are but few. That which is found in Virginia, resembles the common mole, except in colour, which is black, mixed with a deep purple. There are sometimes white moles, seen particularly in Poland, rather larger than the former. As their skin is so very soft and beautiful, it is odd that it has not been turned to any advantage. Agricola tells us, that he saw hats made from it, the finest and most beautiful that could be imagined.

CHAPTER II.

THE HEDGEHOG, OR PRICKLY KIND.

ANIMALS of the Hedgehog kind require but very little accuracy to distinguish them from all others. That hair which serves the generality of quadrupeds for warmth and ornament, is partly wanting in these; while its place is supplied by sharp spines or prickles, that serve for their defence. This general characteristic, therefore, makes a much more obvious distinction than any that can be taken from their teeth or their claws. Nature, by this extraordinary peculiarity, seems to have separated them in a very distinguished manner; so that, instead of classing the hedgehog among the moles, or the porcupine with the hare, as some have done, it is much more natural and obvious to place them, and others approaching them in this strange peculiarity, in a class by themselves; nor let it be supposed, that while I thus alter their arrangement, and separate them from animals with which they have been formerly combined, that I am destroying any secret affinities that exist in nature. It is natural, indeed, for readers to suppose, when they see two such opposite animals as the hare and the porcupine assembled together in the same group, that there must be some material reason, some secret connection, for thus joining animals so little resembling each other in appearance. But the reasons for this union were very slight, and merely arose from a similitude in the fore-teeth; no likeness in the internal conformation, no similitude in nature, in habitudes, or disposition; in short, nothing to fasten the link that combines them, but the similitude in the teeth: this, therefore, may be easily dispensed with; and, as was said, it will be most proper to class them according to their most striking similitudes.

The hedgehog, with an appearance the most formidable, is yet one of the most harmless animals in the world: unable or unwilling to offend, all its precautions are only directed to its own security; and it is armed with a thousand points, to keep off the enemy, but not to invade him. While other creatures trust to their force, their cunning, or their swiftness, this animal, destitute of all, has but one expedient for safety; and from this alone it often finds protection. As soon as it perceives itself attacked, it withdraws all its vulnerable parts, rolls itself into a ball, and presents nothing but its defensive thorns to the enemy; thus, while it attempts to injure no other quadruped, they are equally incapable of injuring it: like those knights, we have somewhere read of, who were armed in such a manner that they could neither conquer others, nor be themselves overcome.

This animal is of two kinds; one with a nose like the snout of a hog; the other more short and blunt, like that of a dog. That with the muzzle of a dog is the most common, being about six inches in length, from the tip of the nose to the insertion of the tail. The tail is little more than an inch long, and so concealed by the spines as to be scarce visible: the head, back, and sides, are covered with prickles; the nose, breast, and belly, are covered with fine soft hair;[*] the legs are short, of a dusky colour, and almost bare; the toes on each foot are five in number, long and separated; the prickles are about an inch in length, and very sharp pointed; their lower part is white, the middle black, and the points white: the eyes are small, and placed high in the head: the ears are round, pretty large and naked; the mouth is small, but well furnished with teeth; these, however, it only uses in chewing its food, but neither in attacking or defending itself against other animals. Its only reliance in cases of danger, is on its spines.

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[*] Præputium propendens. Linnæi Syst. 75. And of the female he might have said, resupina copulatur.

The instant it perceives an enemy, it puts itself into a posture of defence, and keeps upon its guard until it supposes the danger over. On such occasions it immediately alters its whole appearance: from its usual form, somewhat resembling a small animal, with a bunch on its back, the animal begins to bend its back, to lay its head upon its breast, to shut its eyes, to roll down the skin of its sides towards the legs, to draw these up, and lastly, to tuck them in every side, by drawing the skin still closer. In this form, which the hedgehog always puts on when disturbed, it no way resembles an animal, but rather a roundish mass of prickles, impervious on every side. The shape of the animal thus rolled up, somewhat resembles a chestnut in the husk; there being on one side a kind of flat space, which is that on which the head and legs have been tucked in.

Such is the usual appearance of the hedgehog upon the approach of any danger. Thus rolled up in a lump, it patiently waits till its enemy passes by, or is fatigued with fruitless attempts to annoy it. The cat, the weasel, the ferret, and the martin, quickly decline the combat; and the dog himself generally spends his time in empty menaces, rather than in effectual efforts. Every increase of danger only increases the animal's precautions to keep on its guard; its assailant vainly attempts to bite, since he thus more frequently feels than inflicts a wound; he stands enraged and barking, and rolls it along with the paws; still, however, the hedgehog patiently submits to every indignity, but continues secure; and still more to disgust its enemy with the contest, voids its urine, the smell of which is alone sufficient to send him away In this manner the dog, after barking for some time, leaves the hedgehog where he found him, who perceiving the danger past, at length peeps out from its ball, and, if not interrupted, creeps slowly to its retreat.

The hedgehog, like most other wild animals, sleeps by day, and ventures out by night. It generally resides in small thickets, in hedges, or in ditches covered with bushes; there it makes a hole of about six or eight inches deep, and lies well wrapped up in moss, grass, or leaves. Its food is roots, fruits, worms, and insects. It is also said to suck cattle, and hurt their udders; but the smallness of its mouth will serve to clear it of this reproach. It is said also to be very hurtful in gardens and orchards, where it will roll itself in a heap of fruit, and so carry a large quantity away upon its prickles; but this imputation is as ill grounded as the former, since the spines are so disposed, that no fruit will stick upon them, even if we should try to fix them on. It rather appears to be a very serviceable animal in ridding our fields of insects and worms, which are so prejudicial to vegetation.

Mr. Buffon, who kept these animals tame about his house, acquits them of the reproach of being mischievious in the garden, but then he accuses them of tricks, of which, from the form and habits of this animal, one would never be led to suspect them. "I have often," says he, "had the female and her young brought me about the beginning of June. They are generally from three to five in number. They are white in the beginning, and only the marks of their spines appear. I was willing to rear some of them, and accordingly put the dam and her young into a tub, with abundant provision beside them; but the old animal, instead of suckling her young, devoured them all, one after another. On another occasion, a hedgehog that had made its way into the kitchen, discovered a little pot, in which there was meat prepared for boiling. The mischievous animal drew out the meat and left its excrements in the stead. I kept males and females in the same apartment, where they lived together, but never coupled. I permitted several of them to go about my garden, they did very little damage; and it was scarcely perceivable that they were there. They lived upon the fruits that fell from the trees; they dug the earth into shallow holes; they eat caterpillars, beetles, and worms; they were also very fond of flesh, which they devoured boiled or raw."

They couple in the spring, and bring forth about the beginning of summer. They sleep during the winter, and what is said of their laying up provisions for that season, is consequently false. They at no time eat much, and can remain very long without any food whatsoever. Their blood is cold, like all other animals that sleep during the winter. Their flesh is not good for food, and their skins are converted to scarce any use, except to muzzle calves, to keep them from sucking

THE TANREC AND TENDRAC.

The Tanrec and Tendrac, are two little animals, described by Mr. Buffon, of the hedgehog kind; but yet sufficiently different from it, to constitute a different species. Like the hedgehog they are covered with prickles, though mixed in a greater proportion with hair; but unlike that animal, they do not defend themselves by rolling up in a ball. Their wanting this last property is alone sufficient to distinguish them from an animal in which it makes the most striking peculiarity; as also that in the East Indies, where only they are found, the hedgehog exists separately also: a manifest proof that this animal is not a variety caused by the climate.

The Tanrec is much less than the hedgehog,* being about the size of a mole, and covered with prickles, like that animal, except that they are shorter and smaller. The Tendrac is still less than the former, and is defended only with prickles upon the head, the neck, and the shoulders; the rest being covered with a coarse hair, resembling a hog's bristles. These little animals, whose legs are very short, move but slowly. They grunt like a hog; and wallow like it in the mire. They love to be near water, and spend more of their time there than upon land. They are chiefly in creeks and harbours of salt water. They multiply in great numbers, make themselves holes in the ground, and sleep for several months. During this torpid state, their hairs (and I should also suppose their prickles) fall; and they are renewed upon their revival. They are usually very fat; and although their flesh be insipid, soft, and stringy, yet the Indians find it to their taste, and consider it a very great delicacy.

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* Buffon, vol. xxv. p. 254.

THE PORCUPINE.

Those arms which the hedgehog possesses in miniature, the Porcupine has in a more enlarged degree. The short prickles of the hedgehog are in this animal converted into shafts. In the one the spines are about an inch long; in the other a foot. The Porcupine is about two feet long, and fifteen inches high. Like the hedgehog, it appears a mass of misshapen flesh, covered with quills, from ten to fourteen inches long, resembling the barrel of a goose-quill in thickness, but tapering and sharp at both ends. These, whether considered separately or together, afford sufficient subject to detain curiosity. Each quill is thickest in the middle; and inserted into the animal's skin, in the same manner as feathers are found to grow upon birds. It is withinside spongy, like the top of a goose-quill; and of different colours, being white and black alternately, from one end to the other. The biggest are often found fifteen inches long, and a quarter of an inch in diameter; extremely sharp, and capable of inflicting a mortal wound. They seem harder than common quills, being difficult to be cut, and solid at that end which is not fixed in the skin. If we examine them in common, as they grow upon the animal, they appear of two kinds; the one such as I have already described; the other long, flexible, and slender, growing here and there among the former. There is still another sort of quills that grow near the tail, white and transparent, like the writing quills, and that seem to be cut short at the end. All these quills, of whatever kind, incline backwards, like the bristles of a hog; but when the animal is irritated, they rise and stand upright, as bristles are seen to do.

Such is the formation of this quadruped in those parts in which it differs from most others: as to the rest of its figure, the muzzle bears some resemblance to that of a hare, but black; the legs are very short, and the feet have five toes, both before and behind; and these, as well as the belly, the head, and all other parts of the body, are covered with a sort of short hair, like prickles, there being no part except the ears and the sole of the foot, that is free from them. The ears are thinly covered with very fine hair, and are in shape like those of mankind: the eyes are small, like those of a hog, being only one third of an inch from one corner to the other. After the skin is taken off, there appears a kind of paps on those parts of the body from whence the large quills proceed; these are about the size of a small pea, each answering to as many holes which appear on the outward surface of the skin, and which are about half an inch deep, like as many hollow pipes, wherein the quills are fixed, as in so many sheaths.

This animal seems to partake very much of the nature of the hedgehog, having this formidable apparatus of arms rather to defend itself than annoy the enemy. There have been, indeed, many naturalists who supposed that it was capable of discharging them at its foes, and killing at a great distance off. But this opinion has been entirely discredited of late, and it is now universally believed that its quills remain firmly fixed in the skin, and are then only shed when the animal moults them, as birds do their feathers. It is true, we are told by Ellis, that a wolf at Hudson's Bay was found dead, with the quills of a porcupine fixed within its mouth, which might have very well happened from the voraciousness of the former, and not the resentment of the latter. That rapacious creature, in the rage of appetite, might have attempted to devour the porcupine, quills and all, and very probably paid the forfeit by its life. However this be, of all the porcupines that have been brought into Europe, not one was ever seen to launch their quills; and yet the irritations they received were sufficient to have provoked their utmost indignation. Of all the porcupines that Dr. Shaw observed in Africa, and he saw numbers, not one ever attempted to dart its quills, their usual manner of defence being to lie on one side, and when the enemy approaches very near, by suddenly rising, to wound him with the points on the other.

It is probable, therefore, that the porcupine is seldom the aggressor, and when attacked by the bolder animals, it only directs its quills so as to keep always pointing towards the enemy. These are an ample protection, and, as we are assured by Kolben, at such times, even the lion himself will not venture to make an attack. From such, therefore, the porcupine can defend itself, and chiefly hunts for serpents, and all other reptiles, for subsistence. Travellers universally assure us, that between the serpent and the porcupine there exists an irreconcileable enmity, and that they never meet without a mortal engagement.[*] The porcupine on these occasions is said to roll itself upon the serpent, and thus destroy and devour it. This may be true; while what we are informed by Monsieur Sarrasin, of the porcupine of Canada chiefly subsisting on vegetables, may be equally so. Those which are brought to this country to be shown, are usually fed on bread, milk, and fruits; but they will not refuse meat when it is offered them; and it is probable they prefer it in a wild state, when it is to be had.[†] The porcupine is also known to be extremely hurtful to gardens, and where it enters, does incredible damage.

The Americans, who hunt this animal, assure us that the porcupine lives from twelve to fifteen years. During the time of coupling, which is in the month of September, the males become very fierce and dangerous, and are often seen to destroy each other with their teeth. The female goes with young seven months, and brings forth but one at a time; this she suckles but about a month, and accustoms it betimes to live, like herself, upon vegetables and the bark of trees. She is very fierce in its defence, but at other seasons she is fearful, timid, and harmless. The porcupine never attempts to bite, nor any way to injure its pursuers; if hunted by a dog or a wolf, it instantly climbs up a tree, and continues there until it has wearied out the patience of its adversary; the wolf knows by experience how fruitless it would be to wait; he therefore leaves the porcupine above, and seeks out for new adventure.

The porcupine does not escape so well from the Indian hunter, who eagerly pursues it, in order to make embroidery of its quills, and to eat its flesh. This, as we are commonly told, is very tolerable eating however, we may expect wretched provisions when the savages are to be our caterers, for they eat every thing that has life. But they are very ingenious with regard to their embroidery. If I understand the accounts rightly, they dye the quills of various colours, and then splitting them into slips, as we see in the making of a cane chair, they embroider with these their belts, baskets, and several other necessary pieces of furniture.

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[*] Bosman. Smith. L. P. Vincent Marie, &c.

[†] Buffon

As to the rest, there are many things related concerning this animal that are fabulous; but there are still many circumstances more that yet remain to be known. It were curious to inquire whether this animal moults its quills when wild, for it is never seen to shed them in a domestic state; whether it sleeps all the winter, as we are told by some naturalists, which we are sure it does not when brought into our country; and, lastly, whether its quills can be sent off with a shake; for no less a naturalist than Reaumur was of that opinion.

All that we can learn of an animal exposed as a show, or even by its dissection, is but merely its conformation, and that makes one of the least interesting parts of its history. We are naturally led, when presented with an extraordinary creature, to expect something extraordinary in its way of living, something uncommon and corresponding with its figure; but of this animal we know little with any precision, except what it offers in a state of captivity. In such a situation, that which I saw appeared to very little advantage. It was extremely dull and torpid, though very wakeful; and extremely voracious, though very capable of sustaining hunger; as averse to any attachment, as to being tamed. It was kept in an iron cage, and the touching one of the bars was sufficient to excite its resentment, for its quills were instantly erected; and the poet was right in his epithet of *fretful;* for it appeared to me the most irascible creature upon earth.

The porcupines of America differ very much from that of the ancient continent, which we have been describing, and strictly speaking, may be considered as animals of a different species; however, from their being covered with quills, we will only add them as varieties of the former, since we know very little concerning them, except their difference of figure. They are of two kinds; the one called the *couando*, and the other, first named by Mr. Buffon, the *urson:* the one a native of the northern parts of America, the other of the south, and both differing from the former in having long tails, whereas that has a very short one.

The Couando is much less than the porcupine; its quills are four times shorter, its snout more unlike that of a hare; its tail is long enough to catch by the branches of trees and hold by them. It may be easily tamed, and it is to be found chiefly in the southern parts of America, yet is not wanting also in the northern.

The Urson, which Mr. Buffon calls after our countryman, Hudson, is a native of Hudson's Bay. The make of the body of this animal is not so round as that of the two former, but somewhat resembling the shape of a pig. It is covered with long bristly hair, with a shorter hair underneath, and under this the quills lie concealed very thick; they are white, with a brown point, and bearded, and the longest does not exceed four inches; they stick to the hand when the animal is stroked on the back; and likewise when the hand is taken away, they stick so fast as to follow it. They make their nests under the roots of great trees, sleep very much, and chiefly feed upon the bark of the juniper. In winter the snow serves them for drink, and in summer they lap water like a dog. They are very common in the country lying to the east of Hudson's Bay, and several of the trading Americans depend on them for food at some seasons of the year.

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CHAPTER III.

OF QUADRUPEDS COVERED WITH SCALES OR SHELLS INSTEAD OF HAIR.*

WHEN we talk of a quadruped, the name seems to imply an animal covered with hair; when we mention a bird, it is natural to conceive a creature covered with feathers; when we hear of a fish, its scales are generally the first part that strikes our imagination. Nature, however, owns none of our distinctions; various in all her operations, she mixes her plans, groupes her pictures, and excites our wonder, as wel by her general laws as by her deviations. Quadrupeds, which we have considered as making the first general class in Animated Nature, and next to man the most dignified tenants of the earth, are yet, in many respects related to the classes beneath them, and do not in every respect preserve their usual distinctions. Their first character, which consists in having four feet, is common to the lizard kind as well as to them. The second prerogative, which is that of bringing forth living young, is found in the cetaceous tribe of fishes, and also in insects without number. Their third and last attribute, which seems more general and constant than the former, that of being covered with hair, is yet found in various other animals, and is deficient in quadrupeds themselves. Thus we must be cautious of judging of the nature of animals from one single character, which is always found incomplete; for it often happens that three or four of the most general characters will not suffice. It must be by a general enumeration of the parts that we can determine precisely of the works of the creation, and instead of definitions, learn to describe. Had this method been followed, much of the disgust and the intricacy of history might have been avoided, and that time which is now employed in combating error, laid out in the promotion of science.

Were we to judge of Nature from definitions only, we should never be induced to suppose that there existed races of viviparous quadrupeds destitute of hair, and furnished with scales and shells in their stead. However, nature, every way various, supplies us with many instances of these extraordinary creatures; the old world has its quadrupeds covered with scales, and the new with a shell. In both they resemble each other, as well in the strangeness of their appetites as in

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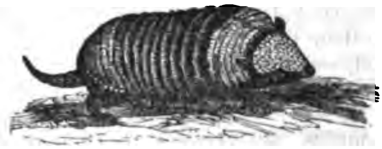
* This chapter is chiefly extracted from Mr. Buffon, which I mention at once, to save the trouble of repeated quotation.

Seal, p. 241.

Beaver, p. 237.

Pangolin, p. 225.

Armadillo, p. 225.


Six-banded Armadillo, p. 225.

To face p. 223, vol. ii.

their awkward conformation. Like animals but partially made up, and partaking of different natures, they want those instincts which animals formed but for one element alone are found to possess. They seem to be a kind of strangers in nature; creatures taken from some other element, and capriciously thrown to find a precarious subsistence upon land.

THE PANGOLIN.

The pangolin, which has been usually called the *scaly lizard*, Mr. Buffon very judiciously restores to that denomination by which it is known in the countries where it is found. The calling it a lizard, he justly observes, might be apt to produce error, and occasion its being confounded with an animal which it resembles only in its general form, and in its being covered with scales. The lizard may be considered as a reptile, produced from an egg; the pangolin is a quadruped, and brought forth alive, and perfectly formed. The lizard is all covered with the marks of scales; the pangolin has scales neither on the throat, the breast, nor the belly. The scales of the lizard seem stuck upon the body even closer than those of fishes, the scales of the pangolin are only fixed at one end, and capable of being erected, like those of the porcupine, at the will of the animal. The lizard is a defenceless creature; the pangolin can roll itself into a ball, like the hedgehog, and presents the points of its scales to the enemy, which effectually defend it.

The pangolin, which is a native of the torrid climates of the ancient continent, is, of all other animals, the best protected from external injury by Nature. It is about three or four feet long; or, taking in the tail, from six to eight. Like the lizard, it has a small head, a very long nose, a short thick neck, a long body, legs very short, and a tail extremely long, thick at the insertion, and terminating in a point. It has no teeth, but is armed with five toes on each foot, with long white claws. But what it is chiefly distinguished by, is its scaly covering, which, in some measure, hides all the proportions of its body. These scales defend the animal on all parts except the under part of the head and neck, under the shoulders, the breast, the belly, and the inner side of the legs; all which parts are covered with a smooth, soft skin, without hair. Between the shells of this animal, at all the interstices, are seen hairs like bristles, brown at the extremity, and yellow towards the root. The scales of this extraordinary creature are of different sizes and different forms, and stuck upon the body somewhat like the leaves of an artichoke. The largest are found near the tail, which is covered with them like the rest of the body. These are above three inches broad, and about two inches long, thick in the middle, and sharp at the edges, and terminated in a roundish point. They are extremely hard, and their substance resembles that of horn. They are convexed on the outside, and a little concave on the inner; one edge sticks in the skin, while the other laps over that immediately behind it. Those that cover the tail conform to the shape of that part, being of a dusky brown colour, and so hard, when the animal has acquired its full growth, as to turn a musket ball.

Thus armed, this animal fears nothing from the efforts of all other creatures except man. The instant it perceives the approach of an enemy, it rolls itself up like the hedgehog, and presents no part but the cutting edges of its scales to the assailant. Its long tail, which at first view might be thought easily separable, serves still more to increase the animal's security. This is lapped round the rest of the body, and being defended with shells even more cutting than any other part, the creature continues in perfect security. Its shells are so large, so thick, and so pointed, that they repel every animal of prey. They make a coat of armour that wounds while it resists, and at once protects and threatens. The most cruel, the most famished quadruped of the forest, the tiger, the panther, and the hyæna, make vain attempts to force it. They tread upon, they roll it about, but all to no purpose: the pangolin remains safe within, while its invader almost always feels the reward of its rashness. The fox often destroys the hedgehog by pressing it with his weight, and thus obliges it to put forth its nose, which he instantly seizes, and soon after the whole body; but the scales of the pangolin effectually support it under any such weight, while nothing that the strongest animals are capable of doing can compel it to surrender. Man alone seems furnished with arms to conquer its obstinacy. The negroes of Africa, when they find it, beat it to death with clubs, and consider its flesh as a very great delicacy.

But, although this animal be so formidable in its appearance, there cannot be a more harmless, inoffensive creature, when unmolested. It is even unqualified by nature to injure larger animals, if it had the disposition, for it has no teeth. It should seem that the bony matter which goes in other animals to supply the teeth, is exhausted in this in supplying the scales that go to the covering of its body. However this be, its life seems correspondent to its peculiar conformation. Incapable of being carnivorous, since it has no teeth, nor of subsisting on vegetables, which require much chewing, it lives entirely upon insects, for which Nature has fitted it in a very extraordinary manner. As it has a long nose, so it may naturally be supposed to have a long tongue; but to increase its length still more, it is doubled in the mouth, so that when extended, it is shot out to above a quarter of a yard beyond the tip of the nose. This tongue is round, extremely red, and covered with an unctuous and slimy liquor, which gives it a shining hue. When the pangolin, therefore, approaches an ant-hill, for these are the insects on which it chiefly feeds, it lies down near it, concealing as much as possible the place of its retreat, and stretching out its long tongue among the ants, keeps it for some time quite immoveable. These little animals, allured by its appearance, and the unctuous substance with which it is smeared, instantly gathers upon it in great numbers; and when the pangolin supposes a sufficiency, it quickly withdraws the tongue and swallows them at once. This peculiar manner of hunting for its prey is repeated, either till it be satisfied, or till the ants, grown more cautious, will no longer be allured to their destruction. It is against these noxious insects, therefore, that its only force or cunning is exerted; and were the negroes but sufficiently sensible of its utility in destroying one of the greatest pests to their country, they would not be so eager to kill it. But it is the nature of savage men to pursue the immediate good, without being solicitous about the more distant benefit they remove. They therefore hunt this animal with the utmost avidity for its flesh; and as it is slow and unable to escape in an open place, they seldom fail of destroying it. However, it chiefly keeps in the most obscure parts of the forest, and digs itself a retreat in the clefts of rocks, where it brings forth its young, so that it is but rarely met with, and continues a solitary species, and an extraordinary instance of the varying of Nature.

Of this animal there is a variety which is called the Phatagin, much less than the former, being not above a foot long from the head to the tail, with shells differently formed, with its belly, breast, and throat covered with hair instead of a smooth skin, as in the former; but that by which it is peculiarly distinguished is the extent of its tail, which is above twice the length of its body. Both are found in the warm latitudes of the East, as well as in Africa, and as their numbers are but few, it is to be supposed their fecundity is not great

THE ARMADILLO, OR TATOU.

Having mentioned quadrupeds of the ancient continent, covered with scales, we come next to quadrupeds of the new continent, covered with shells. It would seem that Nature had reserved all the wonders of her power for these remote and thinly inhabited countries, where the men are savage, and the quadrupeds various. It would seem that she becomes more extraordinary in proportion as she retires from human inspection. But the real fact is, that wherever mankind are polished, or thickly planted, they soon rid the earth of these odd and half-formed productions that in some measure encumber the soil. They soon disappear in a cultivated country, and continue to exist only in those remote deserts where they have no enemies but such as they are enabled to oppose.

The Armadillo is chiefly an inhabitant of South America; a peaceful, harmless creature, incapable of offending any other quadruped, and furnished with a peculiar covering for its own defence. The pangolin described above, seems an inactive, helpless being, indebted for safety more to its patience than its power; but the armadillo is still more exposed and helpless. The pangolin is furnished with an armour that wounds while it resists, and that is never attacked with impunity; but the armadillo is obliged to submit to every insult without any power of repelling its enemy. It is attacked without danger, and is consequently liable to more various persecutions.

This animal being covered, like a tortoise, with a shell, or rather a number of shells, its other proportions are not easily discerned. It appears at first view, a round mis-shapen mass, with a long head, and a very large tail sticking out at either end, as if not a piece with the rest of the body. It is of different sizes, from a foot to three feet long and covered with a shell divided into several pieces that lap over each other like the plaits in a coat of armour, or in the tail of a lobster.—The difference in the size of this animal, and also the different disposition and number of its plaits have been considered as constituting so many species, each marked with its own peculiar name. In all, however, the animal is partially covered with this natural coat of mail, the conformation of which affords one of the most striking curiosities in natural history. This shell, which in every respect resembles a bony substance, covers the head, the neck, the back, the sides, the rump, and the tail to the very point. The only parts to which it does not extend, are the throat, the breast, and the belly, which are covered with a white soft skin, somewhat resembling that of a fowl stripped of its feathers. If these naked parts be observed with attention, they will be found covered with the rudiments of shells of the same substance with those which cover the back. The skin, even in the parts that are softest, seems to have a tendency to ossify; but a complete ossification takes place only on those parts which have the least friction, and are the most exposed to the weather. The shell, which covers the upper part of the body, differs from that of the tortoise in being composed of more pieces than one, which lie in bands over the body, and, as in the tail of the lobster, slide over each other, and are connected by a yellow membrane in the same manner. By this means the animal has a motion in its back, and the armour gives way to its necessary inflections. These bands are of various numbers and sizes, and from them these animals have been distinguished into various kinds. In general, however, there are two large pieces that cover, one the shoulders, and the other the rump. In the back, between these, the bands are placed in different numbers that lap over each other and give play to the whole. Besides their opening cross-ways, they also open down along the back, so that the animal can move in every direction. In some there are but three of these bands between the large pieces; in others there are six; in a third kind there are eight; in a fourth kind, nine; in a fifth kind, twelve; and, lastly, in the sixth kind there is but one large piece, which covers the shoulders, and the rest of the body is covered with bands all down to the tail. These shells are differently coloured in different kinds, but most usually they are of a dirty grey. This colour in all arises from another peculiar circumstance in their conformation, for the shell itself is covered with a softish skin, which is smooth and transparent.

But, although these shells might easily defend this animal from a feeble enemy, yet they could make but a slight resistance against a more powerful antagonist. Nature, therefore, has given the armadillo the same method of protecting itself with the hedgehog or the pangolin. The instant it perceives itself attacked, it withdraws the head under its shells, and lets nothing be seen but the tip of the nose; if the danger increase, the animal's precautions increase in proportion; it then tucks up its feet under its belly, unites its two extremities together, while the tail seems as a band to strengthen the connection, and it thus becomes like a ball, a little flattish on each side. In this position it continues obstinately fixed, while the danger is near, and often long after it is over In this situation it is tossed about at the pleasure of every other quadruped, and very little resembling a creature endowed with life and motion. Whenever the Indians take it, which is in this form, by laying it close to the fire, they soon oblige the poor animal to unfold itself, and to face a milder death to escape a more severe.

This animal is a native only of America, for they were utterly unknown before the discovery of that continent. It is an inoffensive and harmless creature, unless it finds the way into a garden, where it does a great deal of mischief by eating the melons, the potatoes, and other vegetables. Although a native of the warmest parts of America, yet it bears the cold of our climate without any inconvenience. We have often seen them shown among other wild beasts, which is a proof that they are not difficult to be brought over. Their motion seems to be a swift walk, but they can neither run, leap, nor climb trees; so that if found in an open place, they have no method of escaping from their pursuers. Their only resource in such an extremity is to make towards their hole as fast as they can; or, if this be impracticable, to make a new hole before the enemy arrives. For this they require but a very few moments' advantage. The mole itself does not burrow swifter than they can. For this purpose they are furnished with claws extremely large, strong, and crooked, and usually four upon each foot. They are sometimes caught by the tail as they are making their way into the earth; but such is their resistance, and so difficult is it to draw them backward, that they frequently leave their tail in the hand of their pursuer, and are very well contented to save their lives with its loss. The pursuers, however, sensible of this, never drag the tail with all their force, but hold it while another digs the ground about them, and thus these animals are taken alive. The instant the armadillo perceives itself in the power of its enemies, it has but one last resource, to roll itself up, and thus patiently wait whatever tortures they think proper to inflict. The flesh of the smaller kinds is said to be delicate eating, so that we may suppose they receive no mercy. For this reason they are pursued with unceasing industry; and, although they burrow very deep in the earth, there have been many expedients used to force them out. The hunters sometimes contrive to fill their holes with smoke, which is often successful; they at other times force it by pouring in water. They also bring up a small kind of dogs to the chase that quickly overtake them, if any distance from their burrow, and oblige them to roll themselves up in a ball, in which figure the hunters carry them home. If, however, the armadillo be near a precipice, it often escapes by rolling itself up, and then tumbling down from rock to rock, without the least danger or inconvenience. They are sometimes taken in snares laid for them by the sides of rivers and low moist places, which they particularly frequent, and this method in general succeeds better than any of the former, as their burrows are very deep, and they seldom stir out except in the night. At no time are they found at any great distance from their retreats, so that it requires some patience and skill to intercept their retreat.

There are scarce any of these that do not root the ground like a hog, in search of such roots as make a principal part of their food. They live also upon melons and other succulent vegetables, and all will eat flesh when they can get it. They frequent water and watery places, where they feed upon worms, small fish, and water insects. It is pretended that there is a kind of friendship between them and the rattle snake, that they live peaceably and commodiously together, and are frequently found in the same hole. This, however, may be a friendship of necessity to the armadillo; the rattle-snake takes possession of its retreats, which neither are willing to quit, while each is incapable of injuring the other.

As to the rest, these animals, though they all resemble each other in the general character of being clothed with a shell, yet differ a good deal in their size, and in the parts into which their shell is divided. The first of this kind, which has but three bands between the two large pieces that cover the back, is called the Tatu Apara. I will not enter into an exact description of its figure, which, how well written soever, no imagination could exactly conceive, and the reader would be more fatigued to understand than I to write it. The tail is shorter in this than any other kind, not being more than two inches long, while the shell, taking all the pieces together, is a foot long, and eight inches broad. The second is the Tatou of Ray, or the Encoubert of Buffon; this is distinguished from the rest by six bands across the back, and is about the size of a pig of a month old, with a small long head, and a very long tail. The third is the Tatuette, furnished with eight bands, and not by a great deal so big as the former. Its tail is longer also, and its legs shorter in proportion. Its body, from the nose to the insertion of the tail, is about ten inches long, and the tail seven. The fourth is the Pigheaded Armadillo, with nine bands. This is much larger than the former, being about two feet long from the nose to the tail. The fifth is the Kabassou, or Cataphractus, with twelve bands, and still bigger than the former, or any other of its kind. This is often found above three feet long, but is never eaten as the rest are. The sixth is the Weasel-headed Armadillo, with eighteen bands, with a large piece before, and nothing but bands backward. This is above a foot long, and the tail five inches. Of all these, the kabassou and the encoubert are the largest, the rest are of a much smaller kind. In the larger kinds the shell is much more solid than in the others, and the flesh is much harder and unfit for the table. These are generally seen to reside in dry upland grounds, while the small species are always found in moist places, and in the neighbourhood of brooks and rivers. They all roll themselves into a ball; but those whose bands are fewest in number are least capable of covering themselves up completely. The tatu apara, for instance, when rolled up, presents two great interstices between its bands, by which it is very easily vulnerable, even by the feeblest of quadrupeds

CHAPTER IV.

ANIMALS OF THE BAT KIND.

HAVING in the last chapter described a race of animals that unite the boundaries between quadrupeds and insects, I come in this to a very

Vampyre Bat, p. 231.

Bats, p. 228.

To face p. 228. vol. ii.

different class, that serve to fill up the chasm between quadrupeds and birds. Some naturalists, indeed, have found animals of the bat kind so much partaking of the nature of both, that they have been at a loss in which rank to place them, and have doubted, in giving the history of the bat, whether it was a beast or a bird they were describing. These doubts, however, no longer exist; they are now universally made to take their place among quadrupeds, to which their bringing forth their young alive, their hair, their teeth, as well as the rest of their habitudes and conformation, evidently entitle them. Pliny, Gesner, and Aldrovandus, who placed them among birds, did not consider that they wanted every character of that order of animals, except the power of flying. Indeed, when this animal is seen with an awkward and struggling motion, supporting itself in the air at the dusk of the evening, it presents, in some measure, the appearance of a bird; but naturalists whose business it is to examine it more closely, to watch its habitudes, and inspect into its formation, are inexcusable for concurring in the mistake.

The bat in scarce any particular resembles the bird, except in its power of sustaining itself in the air. It brings forth its young alive; it suckles them, its mouth is furnished with teeth; its lungs are formed like those of quadrupeds; its intestines, and its skeleton, have a complete resemblance, and even are, in some measure, seen to resemble those of mankind.*

The bat most common in England, is about the size of a mouse, or nearly two inches and a half long. The membranes that are usually called wings, are, properly speaking, an extension of the skin all round the body, except the head, which, when the animal flies, is kept stretched on every side by the four interior toes of the fore feet, which are enormously long, and serve like masts that keep the canvass of a sail spread, and regulate its motions.† The first toe is quite loose, and serves as a heel when the bat walks, or as a hook when it would adhere to any thing. The hind feet are disengaged from the surrounding skin, and divided into five toes, somewhat resembling those of a mouse. The skin by which it flies is of a dusky colour. The body is covered with a short fur of a mouse colour, tinged with red. The eyes are very small, and the ears like those of a mouse.

This species of the bat is very common in England. It makes its first appearance early in summer, and begins its flight in the dusk of the evening. It principally frequents the sides of woods, glades, and shady walks, and is frequently observed to skim along the surface of pieces of water. It pursues gnats, moths, and nocturnal insects of every kind. It feeds upon these, but will not refuse meat whenever it can find it. Its flight is a laborious, irregular movement; and if it happens to be interrupted in its course, it cannot readily prepare for a second elevation; so that if it strikes against any object, and falls to the ground, it is usually taken. It appears only in the most pleasant evenings, when its prey is generally abroad, and flies in pursuit with its mouth open. At other times it continues in its retreat, the chink of a ruined building, or the hollow of a tree. Thus this little animal, even in summer, sleeps the greatest part of its time, never venturing out by day-light, nor in rainy weather; never hunting in quest of prey, but for a small part of the night, and then returning to its hole. But its short life is still more abridged by continuing in a torpid state during the winter. At the approach of the cold season the bat prepares for its state of lifeless inactivity, and seems rather to choose a place where it may continue safe from interruption, than where it may be warmly or conveniently lodged. For this reason it is usually seen hanging by its hooked claws to the roofs of caves, regardless of the eternal damps that surround it. The bat seems the only animal that will venture to remain in these frightful subterranean abodes, where it continues in a torpid state, unaffected by every change of the weather. Such of this kind as are not provident enough to procure themselves a deep retreat, where the cold and heat seldom vary, are sometimes exposed to great inconveniences, for the weather often becomes so mild in the midst of winter as to warm them prematurely into life, and to allure them from their holes in quest of food when Nature has not provided a supply. These therefore have seldom strength to return; but having exhausted themselves in a vain pursuit after insects which are not to be found, are destroyed by the owl, or any other animal that follows such petty prey.

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* Penis propendens.

† British Zoology.

The bat couples and brings forth in summer, generally from two to five at a time: of this I am certain, that I have found five young ones in a hole together; but whether they were the issue of one parent I cannot tell. The female has but two nipples, and those forward on the breast, as in the human kind. This was a sufficient motive for Linnæus to give it the title of *primas*, to rank it in the same order with mankind, and to push this contemptible animal among the chiefs of the creation. Such arbitrary associations produce rather ridicule than instruction, and render even method contemptible; however, we are to forgive too strong an attachment to system in this able naturalist, since his application to the particular history of this animal counterbalances the defect.*

From Linnæus we learn that the female makes no nest for her young, as most birds and quadrupeds are known to do. She is barely content with the first hole she meets, where, sticking herself by her hooks against the sides of her apartment, she permits her young to hang at the nipple, and in this manner to continue for the first or second day. When, after some time, the dam begins to grow hungry, and finds a necessity of stirring abroad, she takes her little ones and sticks them to the wall in the manner she before hung herself; there they immoveably cling, and patiently wait till her return.

Thus far this animal seems closely allied to the quadruped race. Its similitude to birds is less striking. As Nature has furnished birds with extremely strong pectoral muscles to move the wings, and direct their flight, so has it also furnished this animal. As birds also have their legs weak and unfit for the purposes of motion, the bat has its legs fashioned in the same manner, and is never seen to walk, or, more properly speaking, to push itself forward with its hind legs, but in cases of extreme necessity The toes of the fore legs, or, if we may use the expression, its extremely long fingers extend the web like a membrane that lies between them; and this, which is extremely thin, serves to lift the little body into the air: in this manner, by an unceasing percussion, much swifter than that of birds, the animal continues, and directs its flight; however, the great labour required in flying, soon fatigues it; for, unlike birds, which continue for days together upon the wing, the bat is tired in less than an hour, and then returns to its hole, satisfied with its supply, to enjoy the darkness of its retreat.

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* Fauna Suecica p. 8

If we consider the bat as it is seen in our own country, we shall find a harmless, inoffensive creature. It is true that it now and then steals into a larder, and, like a mouse, commits its petty thefts upon the fattest parts of the bacon. But this happens seldom; the general tenor of its industry is employed in pursuing insects that are much more noxious to us than itself possibly can be, while its evening flight, and its unsteady wabbling motion amuse the imagination, and add one figure more to the pleasing group of Animated Nature.

The varieties of this animal, especially in our country, are but few, and the differences scarce worth enumeration. Naturalists mention the Long-eared Bat, much less than that generally seen, and with much longer ears; the Horse-shoe Bat, with an odd protuberance round its upper lip, somewhat in the form of a horse-shoe; the Rhinoceros Bat, with a horn growing from the nose, somewhat similar to that animal from whence it has the name. These, with several others, whose varieties are too numerous, and differences too minute for a detail are all inoffensive, minute, and contemptible; incapable from their size of injuring mankind, and not sufficiently numerous much to incommode him. But there is a larger race of bats found in the East and West Indies, that are truly formidable; each of these is singly a dangerous enemy, but when they unite in flocks, they then become dreadful. Were the inhabitants of the African coasts,* says Des Marchais, to eat animals of the bat kind, as they do in the East Indies, they would never want a supply of provisions. They are there in such numbers that when they fly they obscure the setting sun. In the morning, at peep of day, they are seen sticking upon the tops of the trees, and clinging to each other like bees when they swarm, or like large clusters of cocoa. The Europeans often amuse themselves with shooting among this huge mass of living creatures, and observing their embarrassment when wounded. They sometimes enter the houses, and the negroes are expert at killing them; but although these people seem for ever hungry, yet they regard the bat with horror, and will not eat it, though ready to starve.

Of foreign bats, the largest we have any certain accounts of, is the Rousette, or the Great Bat of Madagascar. This formidable creature is near four feet broad when the wings are extended, and a foot long from the tip of the nose to the insertion of the tail. It resembles our bat in the form of its wings, in its manner of flying, and in its internal conformation. It differs from it in its enormous size; in its colour, which is red, like that of a fox; in its head and nose also, which resemble those of that animal, and which have induced some to call it the flying fox it differs also in the number of its teeth, and in having a claw on the fore-foot, which is wanting in ours. This formidable creature is found only in the ancient continent; particularly in Madagascar, along the coasts of Africa and Malabar, where it is usually seen about the size of a large hen. When they repose, they stick themselves to the tops of the tallest trees, and hang with their heads downwards. But when they are in motion, nothing can be more formidable. They are seen in clouds, darkening the air, as well by day as by night, destroying the ripe fruits of the country, and sometimes settling upon animals, and even man himself. They devour, indiscriminately, fruits, flesh, and insects, and drink the juice of the palm-tree. They are heard at night in the forests at more than two miles distance, with a horrible din, but at the approach of day they usually begin to retire. Nothing is safe from their depredations: they destroy fowls and domestic animals, unless preserved with the utmost care, and often fasten upon the inhabitants themselves, attack them in the face, and inflict very terrible wounds. In short, as some have already observed, the ancients seem to have taken their ideas of harpies from these fierce and voracious creatures, as they both concur in many parts of the description, being equally deformed, greedy, uncleanly, and cruel.

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* Des Marchais, vol. ii. p. 208.

An animal not so formidable, but still more mischievous than these, is the American Vampyre. This is still less than the former, but more deformed, and still more numerous. It is furnished with a horn like the rhinoceros bat, and its ears are extremely long. The other kinds generally resort to the forest, and the most deserted places; but these come into towns and cities, and after sun-set, when they begin to fly, cover the streets like a canopy.[*] They are the common pest both of men and animals; they effectually destroy the one, and often distress the other. "They are," says Ulloa, "the most expert blood-letters in the world. The inhabitants of those warm latitudes being obliged, by the excessive heats, to leave open the doors and windows of the chambers where they sleep, the vampyres enter, and if they find any part of the body exposed, they never fail to fasten upon it. There they continue to suck the blood; and it often happens that the person dies under the operation. They insinuate their tooth into a vein with all the art of an experienced surgeon, continuing to exhaust the body until they are satiated. I have been assured," continues he, "by persons of the strictest veracity, that such an accident has happened to them; and that, had they not providentially awaked, their sleep would have been their passage into eternity, having lost so large a quantity of blood as hardly to find strength to bind up the orifice. The reason why the puncture is not felt is, besides the great precaution with which it is made, the gentle refreshing agitation of the bat's wings, which contribute to increase sleep, and soften the pain."

The purport of this account has been confirmed by various other travellers, who all agree that this bat is possessed of a faculty of drawing the blood from persons sleeping, and thus often destroying them before they awake. But still a very strong difficulty remains to be accounted for; the manner in which they inflict the wound. Ulloa, as

[*] [illegible] a vol. i. p. 58.

has been seen, supposes that it is done by a single tooth, but this we know to be impossible, since the animal cannot infix one tooth without all the rest accompanying its motions; the teeth of the bat kind being pretty even, and the mouth but small. Mr. Buffon therefore supposes the wound to be inflicted by the tongue, which, however, appears to me too large to inflict an unpainful wound; and even less qualified for that purpose than the teeth. Nor can the tongue as Mr. Buffon seems to suppose, serve for the purposes of suction, since for this it must be hollow, like a syringe, which it is not found to be. I should therefore suppose that the animal is endowed with a strong power of suction, and that without inflicting any wound whatsoever, by continuing to draw, it enlarges the pores of the skin in such a manner that the blood at length passes, and that more freely the longer the operation is continued; so that at last, when the bat goes off, the blood continues to flow. In confirmation of this opinion we are told, that where beasts have a thick skin, this animal cannot injure them; whereas, in horses, mules, and asses, they are very liable to be thus destroyed. As to the rest, these animals are considered as one of the greatest pests of South America, and often prevent the peopling of many parts of that continent, having destroyed at Berja, and several other places, such cattle as were brought there by the missionaries, in order to form a settlement

CHAPTER V

OF AMPHIBIOUS QUADRUPEDS.

THE gradations of Nature from one class of beings to another are made by imperceptible deviations. As we saw in the foregoing chapters, quadrupeds almost degraded into the insect tribe, or mounted among the inhabitants of the air, we are at present to observe their approach to fishes, to trace the degrees by which they become more unlike terrestrial animals, till the similitude of the fish prevails over that of the quadruped.

As in opposite armies the two bodies are distinct and separated from each other, while yet between them are various troops that plunder on both sides, and are friends to neither; so between terrestrial and aquatic animals, there are tribes that can scarce be referred to any rank, but lead an amphibious life between them. Sometimes in water, and sometimes on land, they seem fitted for each element, and yet completely adapted to neither. Wanting the agility of quadrupeds upon land, and the perseverance of fishes in the deep, the variety of their powers only seems to diminish their force; and, though possessed of two different methods of living, they are more inconveniently provided than such as have but one.

All quadrupeds of this kind, though covered with hair in the usual manner, are furnished with membranes between the toes, which assist their motion in the water. Their paws are broad, and their legs short by which they are more completely fitted for swimming; for, taking short strokes at a time, they make them oftener and with greater rapidity. Some, however, of these animals are more adapted to live in the water than others; but, as their power increases to live in the deep, their unfitness for living upon land increases in the same proportion. Some, like the otter, resemble quadrupeds in every thing except in being in some measure web-footed; others depart still further, in being like the beaver, not only web-footed, but having the tail covered with scales, like those of a fish. Others depart yet farther, as the seal and the morse, by having the hind feet stuck to the body like fins; and others, as the lamentin, almost entirely resemble fishes, by having no hind feet whatsoever. Such are the gradations of the amphibious tribe. They all, however, get their living in the water, either by habit or conformation; they all continue a long time under water; they all consider that element as their proper abode; whenever pressed by danger they fly to the water for security; and, when upon land, appear watchful, timorous, and unwieldy.

THE OTTER.

In the first step of the progression from land to amphibious animals, we find the Otter, resembling those of the terrestrial kind in shape, hair, and internal conformation, resembling the acquatic tribes in its manner of living, and in having membranes between the toes to assist it in swimming. From this peculiar make of its feet, which are very short, it swims even faster than it runs, and can overtake fishes in their own element. The colour of this animal is brown, and it is somewhat of the shape of an overgrown weasel, being long, slender, and soft-skinned. However, if we examine its figure in detail, we shall find it unlike any other animal hitherto described, and of such a shape as words can but weakly convey. Its usual length is about two feet long from the tip of the nose to the insertion of the tail; the head and nose are broad and flat; the mouth bears some similitude to that of a fish, the neck is short and equal in thickness to the head; the body long; the tail broad at the insertion, but tapering off to a point at the end; the eyes are very small, and placed nearer the nose than usual in quadrupeds. The legs are very short, but remarkably strong, broad, and muscular. The joints are articulated so loosely that the animal is capable of turning them quite back, and bringing them on line with the body, so as to perform the office of fins. Each foot is furnished with five toes, connected by strong broad webs, like those of water-fowl.—Thus Nature in every part has had attention to the life of an animal whose food is fish, and whose haunts must necessarily be about water.

This voracious animal is never found but at the sides of lakes and rivers, but particularly the former, for it is seldom fond of fishing in a running stream, for the current of the water having more power upon it than the fishes it pursues, if it hunts against the stream, it swims too slow, and if with the stream, it overshoots its prey. However, when in rivers, it is always observed to swim against the stream, and to meet the fishes it preys upon rather than to pursue them. In lakes it destroys much more than it devours, and is often seen to spoil a pond in the space of a few nights. But the damage they do by destroying fish is not so great as their tearing in pieces the nets of the fishers, which they infallibly do whenever they happen to be entangled. The instant they find themselves caught, they go to work with their teeth, and in a few minutes destroy nets of a very considerable value.

The otter has two different methods of fishing; the one by catching its prey from the bottom upward, the other by pursuing it into some little creek, and seizing it there. In the former case, as this animal has longer lungs than most other quadrupeds, upon taking in a quantity of air, it can remain for some minutes at the bottom, and whatever fish passes over at that time is certainly taken; for, as the eyes of fish are placed so as not to see under them, the otter attacks them off their guard from below, and seizing them at once by the belly, drags them on shore, where it often leaves them untouched, to continue the pursuit for hours together. The other method is chiefly practised in lakes and ponds, where there is no current; the fish thus taken are rather of the smaller kind, for the great ones will never be driven out of deep water.

In this manner the otter usually lives during the summer, being furnished with a supply much greater than its consumption, killing for its amusement, and infecting the edges of the lake with quantities of dead fish, which it leaves there as trophies rather of its victory than its necessities. But in winter, when the lakes are frozen over, and the rivers pour with a rapid torrent, the otter is often greatly distressed for provisions, and is then obliged to live upon grass, weeds, and even the bark of trees. It then comes upon land, and grown courageous from necessity, feeds upon terrestrial animals, rats, insects, and even sheep themselves. Nature, however, has given it the power of continuing a long time without food; and although, during that season, it is not rendered quite torpid, like the marmot or the dormouse, yet it keeps much more within its retreat, which is usually the hollow of a bank, worn under by the water. There it often forms a kind of gallery, running for several yards along the edge of the water, so that when attacked at one end, it flies to the other, and often evades the fowler by plunging into the water at forty or fifty paces distant, while he expects to find it just before him.

We learn from Mr. Buffon, that this animal, in France, couples in winter, and brings forth in the beginning of spring. But it is certainly different with us, for its young are never found till the latter end of summer; and I have frequently, when a boy, discovered their retreats and pursued them at that season. I am therefore more inclined to follow the account given us of this animal by Mr. Lots, of the Academy of Stockholm, who assures us that it couples about the middle of summer, and brings forth at the end of nine weeks, generally three or four at a time. This, as well as the generality of his other remarks on this subject, agrees so exactly with what I remember concerning it, that I will beg leave to take him for my guide, assuring the reader that however extraordinary the account may seem, I know it to be certainly a fact.

In the rivers and the lakes frequented by the otter, the bottom is generally stony and uneven, with many trunks of trees, and long roots stretching underneath the water.* The shore also is hollow and scooped inward by the waves. These are the places the otter chiefly chooses for its retreat, and there is scarce a stone which does not bear the mark of its residence, as upon them its excrements are always made. It is chiefly by this mark that its lurking places are known, as well as by the quantity of dead fish that are found lying here and there upon the banks of the water. To take the old ones alive is no easy task, as they are extremely strong, and there are few dogs that will dare to encounter them. They bite with great fierceness, and never let go their hold when they have once fastened. The best way, therefore, is to shoot them at once, as they never will be thoroughly tamed; and if kept for the purposes of fishing, are always apt to take the first opportunity of escaping. But the young ones may be more easily taken and converted to very useful purposes. The otter brings forth its young generally under the hollow banks, upon a bed of rushes, flags, or such weeds as the place affords it in the greatest quantities. I see in the British Zoology a description of its habitation, where that naturalist observes, "that it burrows under ground on the banks of some river or lake, and always makes the entrance of its hole under water, then works up the surface of the earth, and there makes a minute orifice for the admission of air, and this little air-hole is often found in the middle of some thicket." In some places this may be true, but I have never observed any such contrivance; the retreat, indeed, was always at the edge of the water; but it was only sheltered by the impending bank, and the otter itself seemed to have but a small share in its formation. But be this as it may, the young ones are always found at the edge of the water; and if under the protection of their dam, she teaches them instantly to plunge, like herself, into the deep, and escape among the rushes or weeds that fringe the stream. At such times, therefore, it is very difficult to take them; for, though never so young, they swim with great rapidity, and in such a manner that no part of them is seen above water except the tip of the nose. It is only when the dam is absent that they can be taken, and in some places there are dogs purposely trained for discovering their retreats. Whenever the dog comes to the place, he soon, by his barking, shows that the otter is there, which if there be an old one, instantly plunges into the water, and the young all follow. But if the old one be absent, they continue terrified, and will not venture forth but under her guidance and protection. In this manner they are secured and taken home alive, where they are carefully fed with small fish and water. In proportion, however, as they gather strength, they have milk mixed among their food, the quantity of their fish provision is retrenched, and that of vegetables is increased, until at length they are fed wholly upon bread, which perfectly agrees with their constitution. The manner of training them up to hunt for fish, requires not only assiduity, but patience; however, their activity and use, when taught, greatly repays the trouble of teaching; and, perhaps, no other animal is more beneficial to his master The usual way is, first to learn them to fetch, as dogs are instructed; but, as they have not the same docility, so it requires more art and experience to teach them. It is usually performed by accustoming them to take a truss stuffed with wool, of the shape of a fish, and made of leather, in their mouths, and to drop it at the word of command; to run after it when thrown forward, and to bring it to their master. From this they proceed to real fish, which are thrown dead into the water, and which they are taught to fetch from thence. From the dead they proceed to the live, until at last the animal is perfectly instructed in the whole art of fishing. An otter thus taught is a very valuable animal, and will catch fish enough to sustain not only itself but a whole family. I have seen one of these go to a gentleman's pond at the word of command, drive up the fish into a corner and seizing upon the largest of the whole, bring it off in its mouth to its master.

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* Journal Etranger, Juin. 1755. p. 14.

Otters are to be met with in most parts of the world, and rather differ in size and colour from each other than in habitudes or conformation.* In North America and Carolina, they are usually found white, inclining to yellow. The Brazilian otter is much larger than ours, with a roundish head almost like a cat. The tail is shorter, being but five inches long, and the hair is soft, short, and black, except on the head, where it is of a dark brown, with a yellowish spot under the throat.

THE BEAVER.

In all countries, as man is civilized and improved, the lower ranks are repressed and degraded.† Either reduced to servitude, or treated as rebels, all their societies are dissolved, and all their united talents rendered ineffectual. Their feeble arts quickly disappear, and nothing remains but their solitary instincts, or those foreign habitudes which they receive from human education. For this reason there remain no traces of their ancient talents and industry, except in those countries where man himself is a stranger; where, unvisited by his controlling power, for a long succession of ages, their little talents have had time to come to their limited perfection, and their common designs have been capable of being united.

The beaver seems to be now the only remaining monument of brutal society. From the result of its labours, which are still to be seen in the remote parts of America, we learn how far instinct can be aided by imitation. We from thence perceive to what a degree animals without language or reason, can concur for their mutual advantage, and attain by numbers those advantages which each in a state of solitude seems unfitted to possess.

If we examine the beaver merely as an individual, and unconnected with others of its kind, we shall find many other quadrupeds to exceed it in cunning, and almost all in the powers of annoyance and defence. The beaver, when taken from its fellows, and kept in a state of solitude or domestic tameness, appears to be a mild, gentle creature, fa miliar enough, but somewhat dull, and even melancholy; without any violent passions or vehement appetites, moving but seldom, making no efforts to attain any good, except in gnawing the wall of its prison, in order to regain its freedom; yet this, however, without anger or precipitation, but calm and indifferent to all about, without attachment or antipathies, neither seeking to offend, nor desiring to please. It appears inferior to the dog in those qualities which render animals of service to man; it seems made neither to serve, to command, nor to have connections with any other set of beings, and is only adapted for living among its kind. Its talents are entirely repressed in solitude, and are only brought out by society. When alone, it has but little industry, few tricks, and without cunning sufficient to guard against the most obvious and bungling snares laid for it by the hunter. Far from attacking any other animal, it is scarce possessed of the arts of defence. Preferring flight to combat, like all wild animals, it only resists when driven to an extremity, and fights only when its speed can no longer avail.

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* Ray. † Buffon.

But this animal is rather more remarkable for the singularity of its conformation, than any intellectual superiorities it may be supposed, in a state of solitude, to possess. The beaver is the only creature among quadrupeds that has a flat broad tail, covered with scales, which serves as a rudder to direct its motions in the water. It is the sole quadruped that has membranes between the toes on the hind feet only, and none on the fore-feet, which supply the place of hands, as in the squirrel. In short, it is the only animal that in its fore-parts entirely resembles a quadruped, and in its hinder parts seems to approach the nature of fishes, by having a scaly tail. In other respects it is about two feet long and near one foot high; it is somewhat shaped like a rat, except the tail, which, as has been observed, is flat and scaly, somewhat resembling a neat's tongue at the point. Its colour is of a light brown, the hair of two sorts; the one longer and coarser, the other soft, fine, short, and silky. The teeth are like those of a rat or a squirrel, but longer and stronger, and admirably adapted to cutting timber or stripping bark, to which purposes they are constantly applied. One singularity more may be mentioned in its conformation, which is that like birds, it has but one and the same vent for the emission of its excrements and its urine; a strange peculiarity, but which anatomists leave us no room to doubt of.

The beavers begin to assemble about the months of June and July, to form a society that is to continue for the greatest part of the year. They arrive in numbers from every side, and generally form a company of above two hundred. The place of meeting is commonly the place where they fix their abode, and this is always by the side of some lake or river. If it be a lake in which the waters are always upon a level, they dispense with building a dam; but if it be a running stream which is subject to floods and falls, they then set about building a dam, or pier, that crosses the river, so that it forms a dead water in that part which lies above and below. This dam, or pier, is often fourscore or a hundred feet long, and ten or twelve feet thick at the base. If we compare the greatness of the work with the powers of the architect, it will appear enormous; but the solidity with which it is built is still more astonishing than its size. The part of the river over which this dam is usually built, is where it is most shallow, and where some great tree is found growing by the side of the stream. This they pitch upon as proper for making the principal part in their building, and although it is often thicker than a man's body, they instantly set about cutting it down. For this operation they have no other instrument but their teeth, which soon lay it level, and that also on the side they wish it to fall, which is always across the stream. They then fall about cutting off the top branches, to make it lie close and even, and serve as the principal beam of their fabric.*

This dike, or causey, is sometimes ten, and sometimes twelve feet thick at the foundation. It descends in a declivity, or slope, on that side next the water, which gravitates upon the work in proportion to the height, and presses it with a prodigious force towards the earth. The opposite side is erected perpendicular, like our walls; and that declivity which at the bottom or basis is about twelve feet broad, diminishes towards the top, where it is no more than two feet broad, or thereabouts. The materials whereof this mole consists, are wood and clay. The beavers cut with surprising ease large pieces of wood, some as thick as one's arm or thigh, and about four, five, or six feet in length, and sometimes more, according as the slope ascends. They drive one end of these stakes into the ground, at a small distance one from the other, intermingling a few with them that are smaller and more pliant. As the water, however, would find a passage through the intervals or spaces between them, and leave the reservoir dry, they have recourse to a clay which they know where to find, and with which they stop up all the cavities both within and without, so that the water is duly confined. They continue to raise the dike in proportion to the elevation of the water, and the plenty which they have of it. They are likewise conscious that the conveyance of their materials by land would not be so easily accomplished as by water, and therefore they take the advantage of its increase, and swim with their mortar on their tails, and their stakes between their teeth, to the places where there is most occasion for them. If their works are, either by the force of the water or the feet of the huntsmen who run over them, in the least damnified, the breach is instantly made up; every nook and corner of the habitation is reviewed, and with the utmost diligence and application perfectly repaired. But when they find the huntsmen visit them too often, they work only in the night-time, or else abandon their works entirely, and seek out for some safer situation.

The dike, or mole, being thus completed, their next care is to erect their several apartments, which are either round or oval, and divided into three stories, one raised above the other: the first below the level of the causey, which is for the most part full of water; the other two above it. This little fabric is built in a very substantial manner on the edge of their reservoir, and always in such divisions or apartments as above-mentioned, that in case of the water's increase, they may move up a story higher, and be no ways incommoded. If they find any little island contiguous to their reservoir, they fix their mansion there which is then more solid, and not so frequently exposed to the over flowing of the water, in which they are not able to continue for any length of time. In case they cannot pitch upon so commodious a situation, they drive piles into the earth, in order to fence and fortify their habitation against the wind as well as the water. They make two apertures at the bottom, to the stream; one is a passage to their bagnio which they always keep neat and clean; the other leads to that part of the building where every thing is conveyed that will either soil or damage their upper apartments. They have a third opening or doorway, much higher, contrived for the prevention of their being shut up and confined when the frost and snow has closed the apertures of the lower floors. Sometimes they build their houses altogether upon dry land; but then they sink trenches five or six feet deep, in order to descend into the water when they see convenient. They make use of the same materials, and are equally industrious in the erection of their lodges, as their dikes. Their walls are perpendicular, and about two feet thick. As their teeth are more serviceable than saws, they cut off all the wood that projects beyond the wall. After this, when they have mixed up some clay and dry grass together, they work it into a kind of mortar, with which, by the help of their tails, they plaster all their works, both within and without.

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* Spectacle de la Nature.

The inside is vaulted, and is large enough for the reception of eight or ten beavers. In case it rises in an oval figure, it is for the generality above twelve feet long, and eight or ten feet broad. If the number of inhabitants increase to fifteen, twenty, or thirty, the edifice is enlarged in proportion. I have been credibly informed that four hundred beavers have been discovered to reside in one large mansion-house, divided into a vast number of apartments that had a free communication one with another.

All these works, more especially in the northern parts, are finished in August, or September at farthest, at which time they begin to lay in their stores. During the summer they are perfect epicures, and regale themselves every day on the choicest fruits and plants the country affords. Their provisions, indeed, in the winter season, principally consist of the wood of the birch, the plane, and some few other trees, which they steep in water, from time to time, in such quantities as are proportioned to the number of inhabitants. They cut down branches from three to ten feet in length. Those of the largest dimensions are conveyed to their magazines by a whole body of beavers; but the smallest by one only: each of them, however, takes a different way, and has his proper walk assigned him, in order that no one labourer should interrupt another in the prosecution of his work. Their wood-yards are larger or smaller, in proportion to the number in the family; and, according to the observation of some curious naturalists, the usual stock of timber for the accommodation of ten beavers, consists of about thirty feet in a square surface, and ten in depth. These logs are not thrown up in one continued pile, but laid one across the other, with intervals, or small spaces between them, in order to take out with the greater facility but just such a quantity as they shall want for their immediate consumption, and those parcels only, which lie at the bottom ir the water, and have been duly steeped. This timber is cut again into small particles, and conveyed to one of their largest 'odges, where the whole family meet to consume their respective dividends, which are made up impartially in even and equal portions. Sometimes they traverse the woods, and regale their young with a more novel and elegant entertainment.

Such as are used to hunt these animals, know perfectly well that green wood is much more acceptable to them than that which is old and dry, for which reason they plant a considerable quantity of it round their lodgements, and as they come out to partake of it, they either catch them in snares, or take them by surprise. In the winter, when the frosts are very severe, they sometimes break a large hole in the ice, and when the beavers resort thither for the benefit of a little fresh air, they either kill them with their hatchets, or cover them with a large substantial net. After this they undermine and subvert the whole fabric, whereupon the beavers, in hopes to make their escape in the usual way, fly with the utmost precipitation to the water, and plunging into the aperture, fall directly into the net, and are inevitably taken.

THE SEAL.

Every step we proceed in the description of amphibious quadrupeds, we make nearer advances to the tribe of fishes. We first observed the otter, with its feet webbed, and formed for an aquatic life; we next saw the beaver with the hinder parts covered with scales, resembling those of fishes, and we now come to a class of animals in which the shape and habitude of fishes still more apparently prevail, and whose internal conformation attaches them very closely to the water. The seal in general resembles a quadruped in some respects, and a fish in others. The head is round, like that of a man, the nose broad, like that of the otter, the teeth like those of a dog, the eyes large and sparkling; no external ears, but holes that serve for that purpose; the neck is well proportioned, and of a moderate length, but the body thickest where the neck is joined to it. From thence the animal tapers down to the tail, growing all the way smaller, like a fish. The whole body is covered with a thick, bristly, shining hair, which looks as if it were entirely rubbed over with oil, and thus far the quadruped prevails over the aquatic. But it is in the feet that this animal greatly differs from all the rest of the quadruped kind; for though furnished with the same number of bones with other quadrupeds, yet they are so stuck on the body, and so covered with a membrane, that they more resemble fins than feet, and might be taken for such, did not the claws with which they are pointed show their proper analogy. In the fore feet, or rather hands, all the arm and the cubit are hid under the skin, and nothing appears but the hand from the wrist downwards; so that if we imagine a child with its arms swathed down, and nothing appearing but its hands at each side of the body towards the breast, we may have some idea of the formation of this animal in that part. These hands are covered in a thick skin, which serves like a fin for swimming, and are distinguished by five claws, which are long, black, and piercing As to the hind-feet, they are stretched out on each side of the short tail covered with a hairy skin like the former, and both together almost joining at the tail: the whole looks like the broad flat tail of a fish; and, were it not for five claws which appear, might be considered as such. The dimensions of this animal are various, being found from four feet long to nine. They differ also in their colours, some being black, others spotted, some white, and many more yellow. It would, therefore, be almost endless to mention the varieties of this animal.—Buffon describes three, and Krantz mentions five, all different from those described by the other. I might, were I fond of such honours, claim the merit of being a first describer myself; but in fact, the varieties in this animal are so many, that were they all described, the catalogue would be as extensive as it would be unentertaining. It is sufficient to observe, that they agree in the general external characters already mentioned, and internally in two or three more, which are so remarkable as to deserve peculiar attention.

It has been often remarked, that all animals are sagacious in proportion to the size of their brain. It has, in support of this opinion, been alleged that man, with respect to his bulk, has of all others, the largest. In pursuance of this assumption, some erroneous speculations have been formed. But, were the size of the brain to determine the quantity of the understanding, the seal would, of all other animals, be the most sagacious; for it has, in proportion, the largest brain of any, even man himself not excepted. However, this animal is possessed of but very few advantages over other quadrupeds, and the size of its brain furnishes it with few powers that contribute to its wisdom or its preservation.

This animal differs also in the formation of its tongue from all other quadrupeds. It is forked or slit at the end, like that of serpents; but for what purpose it is thus singularly contrived we are at a loss to know. We are much better informed with respect to a third singularity in its conformation, which is, that the *foramen ovale* in the heart is open. Those who are the least acquainted with anatomy, know that the veins uniting bring their blood to the heart, which sends it into the lungs, and from thence it returns to the heart again to be distributed through the whole body. Animals, however, before they are born, make no use of their lungs; and therefore their blood, without entering their lungs, takes a shorter passage through the very partition of the heart, from one of its chambers to the other, thus passing from the veins directly into those vessels that drive it through the whole frame. But the moment the animal is brought forth, the passage through the partition, which passage is called the *foramen ovale*, closes up, and continues closed for ever; for the blood then takes its longest course through the lungs to return to the other chamber of the heart again. Now the seal's heart resembles that of an infant in the womb, for the *foramen ovale* never closes;* and although the blood of this animal commonly circulates through the lungs, yet it can circulate without their assistance, as was observed above, by a shorter way. From hence, therefore, we see the manner in which this animal is adapted for continuing under water; for, being under no immediate necessity of breathing, the vital motions are still carried on while it continues at the bottom; so that it can pursue its prey in that element, and yet enjoy all the delights and advantages of ours.

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* I have followed the usual observations of naturalists with respect to the *foramen ovale* in this animal: I have many reasons, however, to incline me to think that the *foramen* is not entirely open. But this is not the place for a critical inquiry of this kind.

The water is the seal's usual habitation, and whatever fish it can catch, is its food. Though not equal in instinct and cunning to some terrestrial animals, it is greatly superior to the mute tenants of that element in which it chiefly resides. Although it can continue for several minutes under water, yet it is not able, like fishes, to remain there for any length of time; and a seal may be drowned, like any other terrestrial animal. Thus it seems superior, in some respects, to the inhabitants of both elements, and inferior to many more. Although furnished with legs, it is in some measure deprived of all the advantages of them.* They are shut up within its body, while nothing appears but the extremities of them, and these furnished with very little motion, but to serve them as fins in the water. The hind-feet, indeed, being turned backwards, are entirely useless upon land; so that when the animal is obliged to move, it drags itself forward like a reptile, and with an effort more painful. For this purpose it is obliged to use its fore-feet, which, though very short, serve to give such a degree of swiftness, that a man cannot readily overtake it; and it runs towards the sea. As it is thus awkwardly formed for going upon land, it is seldom found at any distance from the sea-shore, but continues to bask upon the rocks, and when disturbed, always plunges down at once to the bottom.

The seal is a social animal, and wherever it frequents, numbers, are generally seen together. They are found in every climate, but in the north and icy seas they are particularly numerous. It is on those shores which are less inhabited than ours, and where the fish resort in greater abundance, that they are seen by thousands, like flocks of sheep, basking on the rocks, and suckling their young. There they keep watch like other gregarious animals, and if an enemy appear, instantly plunge altogether into the water. In fine weather they more usually employ their time in fishing, and generally come on shore in tempests and storms. The seal seems the only animal that takes delight in these tremendous conflicts of Nature. In the midst of thunders and torrents, when every other creature takes refuge from the fury of the elements, the seals are seen by thousands sporting along the shore, and delighted with universal disorder! This, however, may arise from the sea being at that time too turbulent for them to reside in, and they may then particularly come upon land, when unable to resist the shock of their more usual element.

As seals are gregarious, so they are also animals of passage, and perhaps the only quadrupeds that migrate from one part of the world to another. The generality of quadrupeds are contented with their native plains and forests, and seldom stray, except when necessity or fear impels them. But seals change their habitation, and are seen in vast multitudes directing their course from one continent to another.† On the northern coasts of Greenland they are seen to retire in July, and to return again in September. At this time it is supposed they go in pursuit of food. But they make a second departure in March to cast their young, and return in the beginning of June, young and all, in a great body together, observing in their route a certain fixed time and track, like birds of passage. When they go upon this expedition, they are seen in great droves, for many days together, making towards the north, taking that part of the sea most free from ice, and going still forward into those seas where man cannot follow. In what manner they return, or by what passage, is utterly unknown; it is only observed, when they leave the coasts to go upon this expedition, they are all extremely fat, but on their return, they come home excessively lean.

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* Buffon.

† Krantz, vol. i. p. 128.

The females, in our climate, bring forth in winter, and rear their young upon some sand bank, rock, or desolate island, at some distance from the continent. When they suckle their young, they sit up on their hinder-legs, while these, which are at first white, with woolly hair, cling to the teats, of which there are four in number, near the navel.* In this manner the young continue in the place where they are brought forth, for twelve or fifteen days; after which the dam brings them down to the water, and accustoms them to swim and get their food by their own industry. As each litter never exceeds above three or four, so the animal's cares are not much divided, and the education of her little ones is soon completed. In fact, the young are particularly docile; they understand the mother's voice among the numerous bleatings of the rest of the old ones; they mutually assist each other in danger, and are perfectly obedient to her call. Thus early accustomed to subjection, they continue to live in society, hunt and breed together, and have a variety of tones by which they encourage to pursue or warn each other of danger. Some compare their voices to the bleating of a flock of sheep, interrupted now and then by the barking of angry dogs, and sometimes the shriller notes of a cat.† All along the shore, each has its own peculiar rock, of which it takes possession, and where it sleeps when fatigued with fishing, uninterrupted by any of the rest. The only season when their social spirit seems to forsake them, is that when they feel the influences of natural desire. They then fight most desperately; and the male that is victorious, keeps all the females to himself. Their combats, on these occasions, are managed with great obstinacy, and yet great justice: two are never seen to fall upon one together; but each has its antagonist, and all fight an equal battle, till one alone becomes victorious.

We are not certainly informed how long the females continue pregnant; but if we may judge from the time which intervenes between their departure from the Greenland coasts and their return, they cannot go above seven or eight months at the farthest. How long this animal lives is also unknown: a gentleman, whom I knew in Ireland, kept two of them, which he had taken very young, in his house for ten years; and they appeared to have the marks of age at the time I saw them, for they were grown grey about the muzzle; and it is probable they did not live many years longer. In their natural state the old ones are seen very fat and torpid, separated from the rest, and, as it should seem, incapable of procreation.

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* Coeunt in littore resupinata femina. Lin. Syst.

† Linnæi Syst.

As their chief food is fish, so they are very expert at pursuing and catching it. In those places where the herrings are seen in shoals, the seals frequent, and destroy them by thousands. When the herring retires, the seal is then obliged to hunt after fish that are stronger and more capable of evading the pursuit:* however, they are very swift in deep waters, dive with great rapidity, and, while the spectator eyes the spot at which they disappear, they are seen to emerge at above a hundred yards distance. The weaker fishes, therefore, have no other means to escape their tyranny, but by darting into the shallows. The seal has been seen to pursue a mullet, which is a swift swimmer, and to turn it to and fro, in deep water, as a hound does a hare on land. The mullet has been seen trying every art of evasion; and at last swimming into shallow water, in hopes of escaping. There, however, the seal followed; so that the little animal had no other way left to escape, but to throw itself on one side, by which means it darted into shoaler water than it could have swam in with the belly undermost; and thus at last it got free.

As they are thus the tyrants of the element in which they chiefly reside, so they are not very fearful even upon land, except on those shores which are thickly inhabited, and from whence they have been frequently pursued. Along the desert coasts where they are seldom interrupted by man, they seem to be very bold and courageous; if attacked with stones, like dogs, they bite such as are thrown against them; if encountered more closely, they make a desperate resistance, and, while they have any life, attempt to annoy their enemy. Some have been known, even while they were skinning, to turn round and seize their butchers; but they are generally despatched by a stunning blow on the nose. They usually sleep soundly when not frequently disturbed; and that is the time when the hunters surprise them. The Europeans who go into the Greenland seas upon the whale-fishery, surround them with nets, and knock them on the head; but the Greenlanders, who are unprovided with so expensive an apparatus, destroy them in a different manner. One of these little men paddles away in his boat, and when he sees a seal asleep on the side of a rock, darts his lance, and that with such unerring aim, that it never fails to bury its point in the animal's side. The seal, feeling itself wounded, instantly plunges from the top of the rock, lance and all, into the sea, and dives to the bottom; but the lance has a bladder tied to one end, which keeps buoyant, and resists the animal's descent; so that every time the seal rises to the top of the water the Greenlander strikes it with his oar, until he at last despatches it. But in our climate, the seals are much more wary, and seldom suffer the hunter to come near them. They are often seen upon the rocks of the Cornish coast, basking in the sun, or upon the inaccessible cliffs, left dry by the tide. There they continue, extremely watchful, and never sleep long without moving: seldom longer than a minute; for then they raise their heads, and if they see no danger, they lie down again, raising and reclining their heads alternately, at intervals of about a minute each. The only method, therefore, that can be taken, is to shoot them: if they chance to escape, they hasten towards the deep, flinging stones and dirt behind them as they scramble along, and at the same time expressing their pain, or their fears, by the most distressful cry; if they happen to be overtaken, they make a vigorous resistance with their feet and teeth, till they are killed.

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* British Zoology, vol. i. p. 75

The seal is taken for the sake of its skin, and for the oil its fat yields. The former sells for about four shillings; and, when dressed, is very useful in covering trunks, making waistcoats, shot-pouches, and several other conveniences. The flesh of this animal formerly found place at the tables of the great. At a feast provided by Archbishop Neville, for Edward the Fourth, there were twelve seals and porpoises provided, among other extraordinary rarities.

As a variety of this animal, we may mention the Sea-Lion, described in Anson's Voyages. This is much larger than any of the former; being from eleven to eighteen feet long. It is so fat that, when the skin is taken off, the blubber lies a foot thick, all round the body. It seems to differ from the ordinary seal, not only in its size, but also in its food; for it is often seen to graze along the shore, and to feed upon the long grass that grows up along the edges of brooks. Its cry is very various, sometimes resembling the neighing of a horse, and sometimes the grunting of the hog. It may be regarded as the largest of the seal family.

THE MORSE.

The morse is an animal of the seal kind; but differing from the rest, in a very particular formation of the teeth, having two large tusks growing from the upper jaw, shaped like those of an elephant, but directed downwards; whereas, in the elephant, they grow upright, like horns; it also wants the cutting teeth, both above and below: as to the rest, it pretty much resembles a seal, except that it is much larger, being from twelve to sixteen feet long. The morses are also generally seen to frequent the same places that seals are known to reside in; they have the same habitudes, the same advantages, and the same imperfections. There are, however, fewer varieties of the morse than the seal; and they are rarely found, except in the frozen regions near the pole They were formerly more numerous than at present; and the savage natives of the coasts of Greenland destroyed them in much greater quantities before those seas were visited by European ships upon the whale-fishery than now. Whether these animals have been since actually thinned by the fishers, or have removed to some more distant and unfrequented shores is not known; but certain it is, that the Greenlanders, who once had plenty, are now obliged to toil more assiduously for subsistence, and as the quantity of their provisions decrease, for they live mostly upon seals, the numbers of that poor people are every day diminishing. As to the teeth, they are generally from two to three feet long; and the ivory is much more esteemed than that of the elephant, being whiter and harder The fishers have been known formerly to kill

Giraffe, or Camelopard, p. 250.

Morse, p. 246.

To face p. 246, vol. ii.

three or four hundred at once; and along those shores where they chiefly frequented, their bones are still seen lying in prodigious quantities. In this manner, a supply of provisions, which would have supported the Greenland nation for ages, has been, in a few years, sacrificed to those who did not use them, but who sought them for the purposes of avarice and luxury!

THE MANATI.

We come, in the last place, to an animal that terminates the boundary between quadrupeds and fishes. Instead of a creature preying among the deeps, and retiring upon land for repose or refreshment, we have here an animal that never leaves the water, and is enabled to live only there. It cannot be called a quadruped, as it has but two legs only; nor can it be called a fish, as it is covered with hair. In short, it forms the link that unites those two great tribes to each other; and may be indiscriminately called the last of beasts, or the first of fishes.

We have seen the seal approaching nearly to the aquatic tribes, by having its hind legs thrown back on each side of the tail, and forming something that resembled the tail of a fish; but upon examining the skeleton of that animal, its title to the rank of a quadruped was observed plainly to appear, having all the bones of the hinder legs and feet as complete as any other animal whatsoever.

But we are now come to a creature that not only wants the external appearance of hinder legs, but, when examined internally, will be found to want them altogether. The manati is somewhat shaped in the head and the body like a seal; it has also the fore legs or hands pretty much in the same manner, short and webbed, but with four claws only; these also are shorter in proportion than in the former animal, and placed nearer the head; so that they can scarcely assist its motions upon land. But it is in the hinder parts that it chiefly differs from all others of the seal kind; for the tail is perfectly that of a fish, being spread out broad like a fan, and wanting even the vestiges of those bones which make the legs and feet in others of its kind. The largest of these are about twenty-six feet in length; the skin is blackish, very tough and hard; when cut, as black as ebony; and there are a few hairs scattered, like bristles, of about an inch long. The eyes are very small, in proportion to the animal's head; and the ear-holes, for it has no external ears, are so narrow as scarce to admit a pin's head. The tongue is so short, that some have pretended it has none at all; and the teeth are composed only of two solid white bones, running the whole length of both jaws, and formed merely for chewing, and not tearing its vegetable food. The female has breasts placed forward, like those of a woman; and she brings forth but one at a time: this she holds with her paws to her bosom; there it sticks and accompanies her wherever she goes.

This animal can scarcely be called amphibious, as it never entirely leaves the water, only advancing the head out of the stream to reach the grass on the river sides. Its food is entirely upon vegetables; and, therefore, it is never found far in the open sea, but chiefly in the large rivers of South America; and often above two thousand miles from the ocean. It is also found in the seas near Kamschatka, and feeds upon the weeds that grow near the shore. There are likewise level greens at the bottom of some of the Indian bays, and there the manatis are harmlessly seen grazing among turtles and other crustaceous fishes, neither giving nor fearing any disturbance. These animals, when unmolested, keep together in large companies, and surround their young ones.* They bring forth most commonly in autumn; and it is supposed they go with young eighteen months, for the time of generation is in spring.

The manati has no voice nor cry, for the only noise it makes, is by fetching its breath. Its internal parts somewhat resemble those of a horse; its intestines being longer, in proportion, than those of any other creature, the horse only excepted.

The fat of the manati, which lies under the skin, when exposed to the sun, has a fine smell and taste, and far exceeds the fat of any sea animal; it has this peculiar property, that the heat of the sun will not spoil it, nor make it grow rancid; its taste is like the oil of sweet almonds; and it will serve very well, in all cases, instead of butter: any quantity may be taken inwardly with safety, for it has no other effect than keeping the body open. The fat of the tail is of a harder consistence; and, when boiled, is more delicate than the former. The lean is like beef, but more red; and may be kept a long while, in the hottest days, without tainting. It takes up a long time in boiling; and, when done, eats like beef. The fat of the young one is like pork; the lean is like veal; and, upon the whole, it is very probable that this animal's flesh somewhat resembles that of turtle; since they are fed in the same element, and upon the very same food. The turtle is a delicacy well known among us: our luxuries are not as yet sufficiently heigthened to introduce the manati; which, if it could be brought over, might singly suffice for a whole corporation.

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* Acta Petropolitana.

BOOK VII.

OF THE MONKEY KIND—AND OF THE ELEPHANT. RHINOCEROS, &c.

CHAPTER I.

ANIMALS OF THE MONKEY KIND.

QUADRUPEDS may be considered as a numerous group, terminated on every side by some that but in part deserve the name. On one quarter we see a tribe covered with quills, or furnished with wings, that lift them among the inhabitants of the air; on another, we behold a diversity clothed with scales and shells, to rank with insects; and still, on a third, we see them descending into the waters, to live among the mute tenants of that element. We now come to a numerous tribe that, leaving the brute creation, seem to make approaches even to humanity; that bear an awkward resemblance of the human form, and discover some faint efforts at intellectual sagacity.

Animals of the monkey class are furnished with hands instead of paws; their ears, eyes, eye-lids, lips, and breasts, are like those of mankind; their internal conformation also bears some distant likeness, and the whole offers a picture that may well mortify the pride of such as make their persons alone the principal object of their admiration.

These approaches, however, are gradual; and some bear the marks of this our boasted form, more strongly than others.

In the Ape kind we see the whole external machine strongly impressed with the human likeness, and capable of the same exertions: these walk upright, want a tail, have fleshy posteriors, nave calves to their legs, and feet nearly like ours.

In the Baboon kind we perceive a more distant approach to the human form; the quadruped mixing in every part of the animal's figure: these generally go upon all fours; but some, when upright, are as tall as a man; they have short tails, long snouts, and are possessed of brutal fierceness.

The Monkey kind are removed a step further: these are much less than the former, with tails as long, or longer, than their bodies, and flattish faces.

Lastly, the Maki and Opossum kind, seem to lose all resemblance of the human figure, except in having hands; their noses are lengthened out, like those of quadrupeds, and every part of their bodies totally different from the human; however, as they grasp their food, or other objects, with one hand, which quadrupeds cannot do, this single similitude gives them an air of sagacity, to which they have scarce any other pretensions.

From this slight survey, it may be easily seen that one general description will not serve for animals so very different from each other: nevertheless, it would be fatiguing to the last degree, as their varieties are so numerous, and their differences so small, to go through a particular description of each. In this case, it will be best to give a history of the foremost in each class; at the same time marking the distinctions in every species. By this we shall avoid a tedious repetition of similar characters, and consider the manners and the oddities of this phantastic tribe in general points of view; where we shall perceive how nearly they approach to the human figure, and how little they benefit by the approximation. The foremost of the Ape kind is

THE OURAN OUTANG, OR WILD MAN OF THE WOODS.

This name seems to have been given to various animals, agreeing in one common character of walking upright, but coming from different countries, and of very different proportions and powers. The Troglodyte of Bontius, the Drill of Purchas, and the Pigmy of Tyson, have all received this general name; and have been ranked, by some naturalists, under one general description. If we read the accounts of many remote travellers, under this name, we are presented with a formidable animal, from six to eight feet high; if we examine the books of such as have described it nearer home, we find it a pigmy not above three. In this diversity we must be content to blend their various descriptions into one general account; observing, at the same time, that we have no reason to doubt any of their relations, although we are puzzled which to follow.

The Ouran Outang, which, of all other animals, most nearly approaches to the human race, is seen of different sizes, from three to seven feet high. In general, however, its stature is less than that of a man; but its strength and agility much greater. Travellers who have seen various kinds of these animals in their native solitudes, give us surprising relations of their force, their swiftness, their address, and their ferocity. Naturalists who have observed their form and manners at home, have been as much struck with their patient, pliant, imitative dispositions; with their appearance and conformation, so nearly human. Of the smallest sort of these animals we have had several, at different times, brought into this country, all nearly alike; but that observed by Dr. Tyson, is the best known, having been described with the greatest exactness.

The animal which was described by that learned physician was brought from Angola, in Africa, where it had been taken in the internal parts of the country, in company with a female of the same kind, that died by the way. The body was covered with hair, which was of a coal black colour, more resembling human hair than that of brutes. It bore a

Black-Fronted Lemur.

Long-armed Gibbon. p. 255.

Chimpanze, or Pithekos, p. 255

Ourang Outang, p. 250.

Pongo, p. 254

To face p. 250, vol. ii

still stronger similitude in its different lengths; for in those places where it is longest on the human species, it was also longest in this; as on the head, the upper lip, the chin, and the pubes. The face was like that of a man, the forehead larger, and the head round. The upper and lower jaw were not so prominent as in monkeys; but flat, like those of a man. The ears were like that of a man in most respects; and the teeth had more resemblance to the human than those of any other creature. The bending of the arms and legs were just the same as in a man; and, in short, the animal, at first view, presented a figure entirely human.

In order to discover its differences, it was necessary to make a closer survey; and then the imperfections of its form began to appear. The first obvious difference was in the flatness of the nose; the next in the lowness of the forehead, and the wanting the prominence of the chin. The ears were proportionably too large; the eyes too close to each other; and the interval between the nose and mouth too great. The body and limbs differed, in the thighs being too short and the arms too long; in the thumb being too little, and the palm of the hand too narrow. The feet also were rather more like hands than feet; and the animal, if we may judge from the figure, bent too much upon its haunches.

When this creature was examined anatomically, a surprising similitude was seen to prevail in its internal conformaton. It differed from man in the number of its ribs, having thirteen; whereas, in man, there are but twelve. The vertebræ of the neck also were shorter, the bones of the pelvis narrower, the orbits of the eyes were deeper, the kidneys were rounder, the urinary and gall bladders were longer and smaller, and the ureters of a different figure. Such were the principal distinctions between the internal parts of this animal and those of man; in almost every thing else they were entirely and exactly the same, and discovered an astonishing congruity. Indeed, many parts were so much alike in conformation, that it might have excited wonder how they were productive of such few advantages. The tongue, and all the organs of the voice were the same, and yet the animal was dumb; the brain was formed in the same manner with that of man, and yet the creature wanted reason: an evident proof (as Mr. Buffon finely obseves) that no disposition of matter will give mind; and that the body, how nicely soever formed, is formed in vain, when there is not infused a soul to direct its operations.

Having thus taken a comparative view of this creature with man, what follows may be necessary to complete the general description. This animal was very hairy all behind, from the head downwards; and the hair so thick, that it covered the skin almost from being seen: but in all parts before, the hair was much thinner, the skin every where appeared; and in some places it was almost bare. When it went on all fours, as it was sometimes seen to do, it appeared all hairy; when it went erect, it appeared before less hairy, and more like a man. Its hair, which in this particular animal was black, much more resembled that of men, than the fur of brutes; for, in the latter, besides their long hair, there is usually a finer and shorter intermixed; but in the ouran outang it was all of a kind; only about the pubes the hair was grayish, seemed longer, and somewhat different; as also on the upper lip and chin, where it was grayish, like the hair of a beard. The face, hands, and soles of the feet, were without hair; and so was most part of the forehead: but down the sides of the face the hair was thick, it being there about an inch and a half long, which exceeded that on any other part of the body. In the palms of its hands were remarkable those lines which are usually taken notice of in palmistry; and, at the tips of the fingers, those spiral lines observed in man. The palms of the hands were as long as the soles of the feet; and the toes upon these were as long as the fingers; the middle toe was the longest of all, and the whole foot differed from the human. The hinder feet being thus formed as hands, the animal often used them as such; and, on the contrary, now and then made use of its hands instead of feet. The breasts appeared small and shrivelled, but exactly like those of a man: the navel also appeared very fair, and in exact disposition, being neither harder nor more prominent than what is usually seen in children. Such is the description of this extraordinary creature; to which little has been added by succeeding observers, except that the colour of the hair is often found to vary: in that described by Edwards, it was of a reddish brown.

From a picture so like that of the human species, we are naturally led to expect a corresponding mind; and it is certain, that such of these animals has have been shown in Europe, have discovered a degree of imitation beyond what any quadruped can arrive at.

That of Tyson was a gentle, fond, harmless creature. In its passage to England, those that it knew on ship-board, it would embrace with the greatest tenderness, opening their bosoms, and clasping its hands about them. Monkeys of a lower species it held in utter aversion; it would always avoid the place where they were kept in the same vessel; and seemed to consider itself as a creature of higher extraction. After it was taken, and a little used to wear clothes, it grew very fond of them; a part it would put on without any help, and the rest it would carry in its hands to some of the company, for their assistance. It would lie in a bed, place its head on the pillow, and pull the clothes upwards, as a man would do.

That which was seen by Edwards, and described by Buffon, showed even a superior degree of sagacity. It walked, like all of its kind, upon two legs, even though it carried burdens. Its air was melancholy, and deportment grave. Unlike the baboon or monkey, whose motions are violent and appetites capricious, who are fond of mischief, and obedient only from fear, this animal was slow in its motions, and a look was sufficient to keep it in awe I have seen it, says Mr. Buffon, give its hand to show the company to the door: I have seen it sit at table, unfold its napkin, wipe its lips, make use of the spoon and the fork to carry the victuals to its mouth, pour out its drink into a glass, touch glasses when invited, take a cup and saucer and lay them on the table, put in sugar, pour out its tea, leave it to cool before drinking, and all this without any other instigation than the signs or the command of its master, and often of its own accord. It was gentle and inoffensive; it even approached strangers with respect, and came rather to receive caresses than to offer injuries. It was particularly fond of sugared comfits, which every body was ready to give it; and, as it had a defluxion upon the breast, so much sugar contributed to increase the disorder and shorten its life. It continued at Paris but one summer, and died in London. It ate indiscriminately of all things, but it preferred dry and ripe fruits to all other aliments. It would drink wine, but in small quantities, and gladly left it for milk, tea, or any other sweet liquor.

Such these animals appeared when brought into Europe. However, many of their extraordinary habits were probably the result of education, and we are not told how long the instructions they received for this purpose were continued. But we learn from another account that they take but a very short time to come to a great degree of imitative perfection. M. L. Brosse bought two young ones, that were but a year old, from a negro; and these at that early age discovered an astonishing power of imitation.* They even then sat at the table like men, ate of every thing without distinction, made use of their knife, spoon and fork, both to eat their meat and to help themselves. They drank wine and other liquors. When caried on ship-board, they had signs for the cabin boys expressive of their wants; and whenever these neglected attending upon them as they desired, they instantly flew into a passion, seized them by the arm, bit them, and kept them down. The male was sea-sick, and required attendance like a human creature; he was even twice bled in the arm; and every time afterwards when he found himself out of order, he showed his arm, as desirous of being relieved by bleeding.

Pyrard relates, that in the province of Sierra Leona, in Africa, there are a kind of apes, called Baris, which are strong and muscular, and which, if properly instructed when young, serve as very useful domestics. They usually walk upright; they pound at a mortar; they go to the river to fetch water, this they carry back in a little pitcher; on their heads; but if care be not taken to receive the pitcher at their return, they let it fall to the ground, and then, seeing it broken, they begin to lament and cry for their loss. Le Compte's account is much to the same purpose, of an ape, which he saw in the Strait of Molucca. "It walked upon its two hind feet, which it bent a little, like a dog that had been taught to dance. It made use of its hands and arms as we do. Its visage was not much more disagreeable than the Hottentot; but the body was all over covered with a woolly hair of different colours. As to the rest, it cried like a child; all its outward actions were so like the human, and the passions so lively and significant, that dumb men could scarce better express their conceptions and desires. It had also that expression of passion or joy which we often see in children, stamping with its feet, and striking them against the ground, to show its spite, or when refused any thing it passionately longed for. Although these animals," continues he, "are very big, for that I saw was four feet high, their nimbleness is incredible. It is a pleasure beyond expression to see them run up the tackling of a ship, where they sometimes play as if they had a knack of vaulting peculiar to themselves, or as if they had been paid, like our rope-dancers, to divert the company. Sometimes suspended by one arm, they poise themselves, and then turn all of a sudden round about a rope, with as much quickness as a wheel, or a sling put into motion. Sometimes, holding the rope successively with their long fingers, and, letting their whole body fall into the air, they run full speed from one end to the other, and come back again with the same swiftness. There is no posture but they imitate, nor motion but they perform. Bending themselves like a bow, rolling like a bowl, hanging by the hands, feet, and teeth, according to the different fancies with which their capricious imagination supplies them. But what is still more amazing than all this, is their agility to fling themselves from one rope to another, though at thirty, forty, and fifty feet distance."

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* As quoted by Buffon, vol. xxviii. p 77.

Such are the habitudes and the powers of the smaller class of these extraordinary creatures; but we are presented with a different picture in those of a larger stature and more muscular form. The little animals we have been describing, which are seldom found above four feet high, seem to partake of the nature of dwarfs among the human species, being gentle, assiduous, and playful, rather fitted to amuse than terrify. But the gigantic races of the ouran outang, seen and described by travellers, are truly formidable; and in the gloomy forests, where they are only found, seem to hold undisputed dominion. Many of these are as tall or taller than a man; active, strong, and intrepid; cunning, lascivious, and cruel. This redoubtable rival of mankind is found in many parts of Africa, in the East-Indies, in Madagascar, and in Borneo.* In the last of these places, the people of quality course him as we do the stag; and this sort of hunting is one of the favourite amusements of the king himself. This creature is extremely swift of foot, endowed with extraordinary strength, and runs with prodigious celerity. His skin is all hairy, his eyes sunk in his head, his countenance stern, his face tanned, and all his lineaments, though exactly human, harsh and blackened by the sun. In Africa, this creature is even still more formidable. Battel calls him the *pongo*, and assures us that in all his proportions he resembles a man, except that he is much larger, even to a gigantic state. His face resembles that of a man, the eyes deep sunk in the head, the hair on each side extremely long, the visage naked and without hair, as also the ears and hands. The body is lightly covered, and scarcely differing from that of a man, except that there are no calves to the legs. Still, however, the animal is seen to walk upon his hinder legs, and in an erect posture. He sleeps under trees, and builds himself a hut which serves to protect him against the sun and the rains of the tropical climates, of which he is a native. He lives only upon fruits, and is no ways carnivorous. He cannot speak, although furnished with greater instinct than any other animal of the brute creation. When the negroes make fire in the woods, this animal comes near and warms himself by the blaze. However, he has not skill enough to keep the flame alive by feeding it with fuel. They go together in companies; and if they happen to meet one of the human species, remote from succour, they show him no mercy. They even attack the elephant, which they beat with their clubs, and oblige to leave that part of the forest which they claim as their own. It is impossible to take any of those dreadful creatures alive, for they are so strong that ten men would not be a match for but one of them. None of this kind, therefore, are taken except when very young, and these but rarely, when the female happens to leave them behind; for in general they keep clung to the breast, and adhere both with legs and arms. From the same traveller we learn, that when one of these animals dies, the rest cover the body with a quantity of leaves and branches. They sometimes also show mercy to the human kind. A negro boy, that was taken by one of these, and carried into the woods, continued there a whole year, without receiving any injury.* From another traveller we learn, that these animals often attempt to surprise the female negroes as they go into the woods, and frequently keep them against their wills for the pleasure of their company, feeding them very plentifully all the time. He assures us that he knew a woman of Loango that had lived among these animals for three years. They grow from six to seven feet high, and are of unequalled strength. They build sheds, and make use of clubs for their defence. Their faces are broad, their noses flat, their ears without a tip, their skins are more bright than that of a mulatto, and they are covered on many parts of the body with long and tawny coloured hair. Their belly is large, their heels flat, and yet rising behind. They sometimes walk upright, and sometimes upon all fours, when they are fantastically disposed.

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* Le Compte's History of China.

From this discription of the ouran outang, we perceive at what a distance the first animal of the brute creation is placed from the very lowest of the human species. Even in countries peopled with savages, this creature is considered as a beast; and in those very places where we might suppose the smallest difference between them and mankind, the inhabitants hold it in the greatest contempt and detestation. In Borneo, where this animal has been said to come to its greatest perfection, the natives hunt it in the same manner as they pursue the elephant or the lion, while its resemblance to the human from procures it neither pity nor protection. The gradations of Nature in the other parts of Nature are minute and insensible; in the passage from quadrupeds to fishes we can scarce tell where the quadruped ends and the fish begins; in the descent from beasts to insects we can hardly distinguish the steps of the progression; but in the ascent from brutes to man, the line is strongly drawn, well marked, and unpassable. It is in vain that the ouran outang resembles man in form, or imitates many of his actions; he still continues a wretched, helpless creature, pent up in the most gloomy part of the forest, and, with regard to the provision for his own happiness, inferior even to the elephant or the beaver in sagacity. To us, indeed, this animal seems much wiser than it really is. As we have long been used to measure the sagacity of all actions by their similitude to our own, and not their fitness to the animal's way of living, we are pleased with the imitations of the ape, even though we know they are far from contributing to the convenience of its situation An ape, or a quadruped, when under the trammels of human education, may be an admirable object for human curiosity, but is very little advanced by all its learning in the road to its own felicity. On the contrary I have never seen any of these long-instructed animals that did not, by their melancholy air, appear sensible of the wretchedness of their situation. Its marks of seeming sagacity were merely relative to us and not to the animal; and all its boasted wisdom was merely of our own making.

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* Le Brosse, as quoted by Buffon, vol. xxviii. p. 70

There is, in fact, another circumstance relative to this animal which ought not to be concealed. I have many reasons to believe that the most perfect of the kind are prone, like the rest of the quadruped creation, and only owe their erect attitude to human education. Almost all the travellers who speak of them mention their going sometimes upon all fours, and sometimes erect. As their chief residence is among trees, they are without doubt usually seen erect while they are climbing; but it is more than probable that their efforts to escape upon the ground are by running upon the hands and feet together. Schouten, who mentions their education, tells us that they are taken in traps, and taught in the beginning to walk upon their hind legs; which certainly implies that in a state of Nature they run upon all fours. Add to this, that, when we examine the palms of their hands and the soles of their feet, we find both equally callous and beaten; a certain proof that both have been equally used. In those hot countries, where the apes are known to reside, the soles of the Negroes' feet, who go bare-foot, are covered with a skin above an inch thick; while their hands are as soft as those of an European. Did the apes walk in the same manner, the same exercise would have furnished them with similar advantages, which is not the case. Besides all this, I have been assured by a very credible traveller, that these animals naturally run in the woods upon all fours: and when they are taken, their hands are tied behind them, to teach them to walk upright. This attitude they learn after some time; and, thus instructed, they are sent into Europe to astonish the speculative with their near approaches to humanity, while it is never considered how much is natural, and how much has been acquired in the savage schools of Benin and Angola.

The animal next to these, and to be placed in the same class, is the Ape, properly so called, or the Pithekos of the ancients. This is much less than the former, being not above a foot and a half high, but walks erect, is without a tail, and is easily tamed.

Of this kind also is the Gibbon, so called by Buffon, or the Long Armed Ape, which is a very extraordinary and remarkable creature. It is of different sizes, being from two to four feet high. It walks erect, is without a tail, has a face resembling that of a man, with a circle of bushy hair all around the visage; its eyes are large and sunk in its head; its face tanned, and its ears exactly proportioned. But that in which it chiefly differs from all others of the monkey tribe, is the extraordinary length of its arms, which, when the animal stands erect are long enough to reach the ground; so that it can walk upon all fours and yet keep its erect posture at the same time. This animal, next to the ouran outang and the ape, most nearly resembles mankind, not only in form but in gentle manners and tractable disposition. It is a native of the East Indies, and particularly found along the coast of Coromandel.

The last of the ape kind is the Cynocephalus, or the Magot of Buffon. This animal wants a tail, like the former, although there is a small protuberance at that part; which yet is rather formed by the skin than the bone. It differs also in having a large, callous, red rump. The face is prominent, and approaches more to that of quadrupeds than of man. The body is covered with a brownish hair, and yellow on the belly. It is about three feet and a half, or four feet high, and is a native of most parts of Africa and the East. As it recedes from man in its form, so also it appears different in its dispositions, being sullen, vicious, and untractable*.

THE BABOON.

Descending from the more perfect of the monkey kinds, we come to the baboon and its varieties, a large, fierce, and formidable race, that mixing the figure of the man and the quadruped in their conformation, seems to possess only the defects of both; the petulance of the one, and the ferocity of the other. These animals have a short tail; a prominent face; with canine teeth, larger than those of men, and callosities on the rump†. In man the physiognomy may deceive, and the figure of the body does not always lead to the qualities of the mind; but in animals we may always judge of their dispositions by their looks, and form a just conjecture of their internal habits from their external form. If we compare the nature of the ape and the baboon by this easy rule, we shall at once be led to pronounce that they greatly differ in their dispositions, and that the latter are infinitely more fierce, savage, and malicious, than the former. The ouran outang, that so nearly resembles man in its figure, approaches also nearest in the gentleness of its manners and the pliancy of its temper. The cynocephalus, that of all other apes is most unlike man in form, and approaches nearer the dog in face, resembles also the brute in nature, being wild, restless, and impelled by a fretful impetuosity. But the baboon, who is still more remote, and resembles man only in having hands; who, from having a tail, a prominent face, and sharp claws, approaches more nearly to the savage tribe, is every way fierce, malicious, ignorant, and untractable.

The Baboon, properly so called, is from three to four feet high, very strong built, with a thick body and limbs, and canine teeth much longer than those of men. It has large callosities behind, which are quite naked and red. Its tail is crooked and thick, and about seven or eight inches long. Its snout, for it can hardly be called a face, is long and thick, and on each side of its cheeks it has a pouch, into which, when satiated with eating, it puts the remainder of its provisions. It is covered with long, thick hair, of a reddish brown colour, and pretty uniform over the whole body. It walks more commonly upon all fours than upright, and its hands as well as its feet are armed with long sharp claws, instead of the broad round nails of the ape kind.

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* Omnes femellæ hujusce et precedentium, ut et fere sequentium specierum menstruali patiuntur fluxu sicut in feminis.

† Buffon, vol. xxxvii., p. 183.

An animal thus made for strength, and furnished with dangerous weapons, is found, in fact, to be one of the most formidable of the savage race in those countries, where it is bred. It appears, in its native woods, to be impelled by two opposite passions; a hatred for the males of the human species, and a desire for women. Were we assured of these strange oppositions in its disposition from one testimony alone, the account might appear doubtful; but as it comes from a variety of the most credible witnesses, we cannot refuse our assent. From them, therefore, we learn, that these animals will often assail women in a body, and force them into the woods, where they keep them against their will, and kill them when refractory. From the Chevalier Forbin we learn, that in Siam, whole troops of these will often sally forth from their forests, and attack a village, when they know the men are engaged in their rice harvest. They are, on such occasions, actuated as well by desire as by hunger; and not only plunder the houses of whatever provisions they can find, but endeavour to force the women. These, however, as the Chevalier humorously relates, not at all liking either the manners or the figure of the paltry gallants, boldly stand on their defence, and with clubs, or whatever other arms they can provide, instead of answering their caresses, oblige their ugly suitors to retreat; not, however, before they have damaged or plundered every thing eatable they can lay their hands on.

At the Cape of Good Hope they are less formidable, but, to the best of their power, equally mischievous. They are there under a sort of natural discipline, and go about whatever they undertake with surprising skill and regularity. When they set about robbing an orchard or a vineyard, for they are extremely fond of grapes, apples, and ripe fruit, they do not go singly to work, but in large companies, and with preconcerted deliberation. On these occasions, a part of them enter the inclosure, while one is set to watch. The rest stand without the fence, and form a line reaching all the way from their fellows within to their rendezvous without, which is generally in some craggy mountain. Every thing being thus disposed, the plunderers within the orchard throw the fruit to those that are without as fast as they can gather it; or, if the wall or hedge be high, to those that sit on the top; and these hand the plunder to those next them on the other side.—Thus the fruit is pitched from one to another all along the line, till it is safely deposited at their head-quarters. They catch it as readily as the most skilful tennis-player can a ball; and while the business is going forward, which they conduct with great expedition, a most profound silence is observed among them. Their sentinel, during this whole time, continues upon the watch, extremely anxious and attentive; but, if he perceives any one coming, he instantly sets up a loud cry, and at this signal the whole company scamper off. Nor yet are they at any time willing to leave the place empty handed; for if they be plundering a bed of melons, for instance, they go off with one in their mouths, one in their hands, and one under their arm. If the pursuit is hot, they drop first that from under their arm, and then that from their hand; and, if it be continued, they at last let fall that which they had hitherto kept in their mouths.

The natives of the Cape often take the young of these animals, and feeding them with sheep and goat's milk, accustom them to guard their houses; which duty they perform with great punctuality. Those, however, that have been brought into Europe, are headstrong, rude, and untractable. Dogs and cats, when they have done any thing wrong, will run off; but these seem careless and insensible of the mischief they do; and I have seen one of them break a whole table of china, as it should seem by design, without appearing in the least conscious of having done amiss. It was not, however, in any respect so formidable as that described by Mr. Buffon, of which he gives the following description:—"It was not," says he "extremely ugly, and yet it excited horror. It continually appeared in a state of savage ferocity, gnashing its teeth, flying at the spectators, and furiously restless. It was obliged to be confined in an iron cage, the bars of which it so forcibly attempted to break, that the spectators were struck with apprehension. It was a sturdy, bold animal, whose short limbs and powerful exertions showed vast strength and agility. The long hair with which it was covered seemed to add to its apparent abilities; which, however, were in reality so great, that it could easily overcome a single man, unless armed. As to the rest, it for ever appeared excited by that passion which renders the mildest animals at intervals furious. Its lasciviousness was constant, and its satisfactions particular. Some others also of the monkey kind showed the same degree of impudence, and particularly in the presence of women; but, as they were less in size, their petulance was less obvious, and their insolence more easily corrected."

But however violent the desires of these animals may be, they are not found to breed in our climate. The female brings forth usually but one at a time, which she carries in her arms, and in a peculiar manner clinging to her breast. As to the rest, these animals are not at all carnivorous; they principally feed upon fruits, roots, and corn, and generally keep together in companies. The internal parts are more unlike those of man, than of quadrupeds, particularly the liver, which is like that of a dog, divided into six lobes. The lungs are more divided, the guts in general are shorter, and the kidneys rounder and flatter.

The largest of the baboon kind is the Mandril; an ugly, disgusting animal, with a tail shorter than the former, though of a much larger stature, being from four to five feet high. The muzzle is still longer than that of the preceding, it is of a bluish colour, and strongly marked with wrinkles, which give it a frightful appearance. But what renders it truly loathsome is, that from the nose there is always seen issuing a snot, which the animal takes care at intervals to lick off with its tongue and swallow. It is a native of the Gold Coast; it is said to walk more frequently erect than upon all fours; and, when displeased, to weep like a child. There was one of them shown in England some years ago. It seemed tame but stupid, and had a method of opening its mouth and blowing at such as came too near.

The Wanderow, is a baboon rather less than the former, with the body less compact and muscular, and the hinder parts seemingly more feeble. The tail is from seven to eight inches long; the muzzle is prominent, as in the rest of this kind; but what particularly distinguishes it, is a large long white head of hair, together with a monstrous white beard, coarse, rough, and descending; the colour of the rest of the body being brown or black. As to the rest, in its savage state, it is eqvally fierce with the others; but, with a proper education, it seems more tractable than most of its kind, and is chiefly seen in the woods of Ceylon and Malabar.

The Maimon of Buffon, which Edwards calls the Pigtail, is the last of the baboons, and in size rather approaches the monkey, being no larger than a cat. Its chief distinction, besides its prominent muzzle like a baboon, is in the tail, which is about five or six inches long, and curled up like that of a hog; from which circumstance peculiar to this animal, our English naturalist gave it the name. It is a native of Sumatra, and does not well endure the rigours of our climate. Edwards, however, kept one of them a year in London.; and another of them happening at the same time to be exposed in a show of beasts, he brought the two exiles together, to see if they would claim or acknowledge their kindred. The moment they came into each other's presence, they testified their mutual satisfaction, and seemed quite transported at the interview.

THE MONKEY.

The varieties in the larger tribes of the monkey kind are but few in the ape we have seen but four, and in the baboon about as many But when we come to the smaller class, the differences among them seem too tedious for enumeration. These, as was observed in the beginning, are all small in stature, and with long tails, by which they are distinguished from the preceding, that entirely want the tail, or are large and have but a short one. The varieties in the form and colour of dogs, or squirrels, is nothing to what are found among monkeys of the smaller kind. Bosman mentions above fifty sorts on the Gold Coast alone, and Smith confirms the account. Condamine asserts that it would take up a volume to describe the differences of these to be found along the river Amazons; and we are sure that every one of these is very different from those on the African coast. Naturalists, however, have undertaken to make a catalogue of their numbers; and they either transmit their descriptions from one to another, or only enumerate those few that have found their way to Europe, and have fallen within the narrow circle of their own observation. But, though it may be proper enough to describe such as fall under notice, it is certainly wrong to offer a scanty catalogue as complete, and to induce the reader to suppose he sees a picture of the whole groupe of these animals, when he is only presented with a small part of the number. Such, therefore, as are fond of the reputation of adding new descriptions to the stock of natural history, have here a wide, though surely a barren, field to enlarge in; and they will find it no difficult matter, by observing the various animals of this kind that are from time to time brought from their native coasts to this country, to indulge in description, and to ring the changes upon all the technical terms with which this most pleasing science is obscured and rendered disgusting. For my own part, I will spare the reader and myself the trouble of entering into an elaborate description of each; content with observing once more, that their numbers are very great, and their differences very trifling. There is scarce a country in the tropical climates that does not swarm with them, and scarce a forest that is not inhabited by a race of monkeys distinct from all others. Every different wood along the coasts of Africa may be considered as a separate colony of monkeys, differing from those of the next district in colour, in size, and malicious mischief. It is indeed remarkable that the monkeys of two cantons are never found to mix with each other, but rigorously to observe a separation; each forest produces only its own; and these guard their limits from the intrusion of all strangers of a different race from themselves. In this they somewhat resemble the human inhabitants of the savage nations, among whom they are found, where the petty kingdoms are numerous, and their manners opposite. There, in the extent of a few miles, the traveller is presented with men speaking different languages, professing different religions, governed by different laws, and only resembling each other in their mutual animosity.

In general, monkeys of all kinds, being less than the baboon, are endowed with less powers of mischief. Indeed, the ferocity of their nature seems to diminish with their size; and when taken wild in the woods, they are sooner tamed, and more easily taught to imitate man than the former. More gentle than the baboon, and less grave and sullen than the ape, they soon begin to exert all their sportive mimicries, and are easily restrained by correction. But it must be confessed that they will do nothing they are desired, without beating; for if their fears be entirely removed, they are the most insolent and headstrong animals in nature.

In their native woods they are not less the pests of man than of other animals. The monkeys, says a traveller,* are in possession of every forest where they reside, and may be considered as the masters of the place. Neither the tiger, nor the lion itself, will venture to dispute the dominion, since these, from the tops of trees, continually carry on an offensive war, and by their agility escape all possibility of pursuit. Nor have the birds less to fear from their continual depredations; for, as these harmless inhabitants of the wood usually build upon trees, the monkeys are for ever on the watch to find out and rob their nests; and such is their petulant delight in mischief, that they will fling their eggs against the ground when they want appetites or inclination to devour them.

There is but one animal in all the forest that ventures to oppose the monkey, and that is the serpent. The larger snakes are often seen winding up the trees where the monkeys reside; and, when they happen to surprise them sleeping, swallow them whole before the little animals have time to make a defence. In this manner, the two most mischievous kinds in all Nature keep the whole forest between them; both equally formidable to each other, and for ever employed in mutual hostilities. The monkeys, in general, inhabit the tops of the trees and the serpents cling to the branches nearer the bottom, and in this manner they are for ever seen near each other, like enemies in the same field of battle. Some travellers, indeed have supposed that their vicinity rather argued their mutual friendship, and that they united in this manner to form an offensive league against all the rest of Animated Nature.* "I have seen these monkeys," says Labat, "playing their gambols upon those very branches on which the snakes were reposing, and jumping over them without receiving any injury, although the serpents of that country were naturally vindictive, and always ready to bite whatever disturbed them." These gambols, however, were probably nothing more than the insults of an enemy that was conscious of its own safety; and the monkey might have provoked the snake in the same manner as we often see sparrows twitter at a cat. However this be, the forest is generally divided between them; and these woods, which nature seems to have embellished with her richest magnificence, rather inspire terror than delight, and chiefly serve as retreats for mischief and malignity.

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* Description Historique de Macaçar. p. 51.

The enmity of these animals to mankind, is partly ridiculous, and partly formidable. They seem, says Le Comte, and others, to have a peculiar instinct in discovering their foes; and are perfectly skilled, when attacked, in mutually defending and assisting each other. When a traveller enters among these woods, they consider him as an invader upon their dominions, and all join to repel the intrusion. At first they survey him with a kind of insolent curiosity. They jump from branch to branch, pursue him as he goes along, and make a loud chattering, to call the rest of their companions together. They then begin their hostilities by grinning, threatening; and flinging down the withered branches at him, which they break from the trees: they even take their excrements in their hands, and throw them at his head. Thus they attend him wherever he goes; jumping from tree to tree with such amazing swiftness, that the eye can scarce attend their motions. Although they take the most desperate leaps, yet they are seldom seen to come to the ground, for they easily fasten upon the branches that break their fall, and stick, either by their hands, feet, or tail, wherever they touch. If one of them happens to be wounded, the rest assemble round, and clap their fingers into the wound, as if they were desirous of sounding its depth. If the blood flows in any quantity, some of them keep it shut up, while others get leaves, which they chew, and thrust into the opening: however extraordinary this may appear, it is asserted to be often seen, and to be strictly true. In this manner they wage a petulant, unequal war; and are often killed in numbers before they think proper to make a retreat. This they effect with the same precipitation with which they at first come together In this retreat the young are seen clinging to the back of the female with which she jumps away, seemingly unembarrassed by the burden

The curiosity of the Europeans has, in some measure, induced the natives of the places where these animals reside, to catch or take them alive by every art they are able. The usual way in such case, is to shoot the female as she carries her young, and then both, of course, tumble to the ground. But even this is not easily performed; for it

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* Labat, Relat. de l' Afriq. Occident, p. 317

Baboon, p. 257

Monkeys, p. 249.

To face p. 262, vol. ii.

the animal be not killed outright, it will not fall; but clinging to some branch, continues, even when dead, its former grasp, and remains on the tree where it was shot, until it drops off by putrefaction. In this manner it is totally lost to the pursuer; for to attempt climbing the tree, to bring either it or the young one down, would probably be fatal from the number of serpents that are hid among the branches. For this reason the sportsman always takes care to aim at the head; which, if he hits, the monkey falls directly to the ground; and the young one comes down at the same time, clinging to its dead parent.

The Europeans along the coasts of Guinea, often go into the woods to shoot monkeys; and nothing pleases the Negroes more than to see these animals drop, against which they have the greatest animosity. They consider them, and not without reason, as the most mischievous and tormenting creatures in the world; and are happy to see their numbers destroyed, upon a double account; as well because they dread their devastations, as because they love their flesh. The monkey, which is always skinned before it is eaten, when served up at a negro feast, looks so like a child, that an European is shocked at the very sight. The natives, however, who are not so nice, devour it as one of the highest delicacies; and assiduously attend our sportsmen, to profit by the spoil. But what they are chiefly astonished at, is to see our travellers carefully taking the young ones alive, while they leave them the old ones, that are certainly the most fit to be eaten. They cannot comprehend what advantage can arise to us from educating or keeping a little animal, that, by experience, they know to be equally fraught with tricks and mischief: some of them have even been led to suppose, that, with a kind of perverse affection, we love only creatures of the most mischievous kinds: and seeing us buy young and tame monkeys, they have taken equal care to bring rats to our factors, offering them for sale, and greatly disappointed at finding no purchase for so hopeful a commodity.*

The Negroes consider these animals as their greatest plague; and indeed, they do incredible damage, when they come in companies to lay waste a field of Indian corn or rice, or a plantation of sugar canes. They carry off as much as they are able; and they destroy ten times more than they bear away. Their manner of plundering is pretty much like that of the baboons, already mentioned, in a garden. One of them stands centinel upon a tree, while the rest are plundering, carefully and cautiously turning on every side, but particularly to that on which there is the greatest danger: in the mean time, the rest of the spoilers pursue their work with great silence and assiduity; they are not contented with the first blade of corn, or the first cane that they happen to lay their hands on: they first pull up such as appear most alluring to the eye: they turn it round, examine, compare it with others, and if they find it to their mind, stick it under one of their shoulders. When in this manner they have got their load, they begin to think of retreating: but if it should happen that the owners of the field appear to interrupt their depredations, their faithful centinel instantly gives notice, by crying out, *Houp, houp, houp*; which the rest perfectly understand, and all at once throwing down the corn they hold in their left hands, scamper off upon three legs, carrying the remainder in the right. If they are still hotly pursued, they then are content to throw down their whole burden, and to take refuge among their woods, on the top of which they remain in perfect security.

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* Labat, Relat. de l'Afriq. Occident, p. 317.

Were we to give faith to what some travellers assure us, of the government, policies, and subordination of these animals, we might perhaps be taxed with credulity; but we have no reason to doubt that they are under a kind of discipline, which they exercise among each other. They are generally seen to keep together in companies, to march in exact order, and to obey the voice of some particular chieftain, remarkable for his size and gravity. One species of these, which Mr. Buffon calls the Ouarine, and which are remarkable for the loudness and the distinctness of their voice, are still more so for the use to which they convert it. "I have frequently been a witness," says Margrave, "of their assemblies and deliberations. Every day, both morning and evening, the ouarines assemble in the woods to receive instructions. When all come together, one among the number takes the highest place on a tree, and makes a signal with his hand to the rest to sit round, in order to hearken. As soon as he sees them placed, he begins his discourse, with so loud a voice, and yet in a manner so precipitate, that to hear him at a distance, one would think the whole company were crying out at the same time: however, during that time, one only is speaking; and all the rest observe the most profound silence. When this has done, he makes a sign with the hand for the rest to reply; and at that instant they raise their voices together, until by another signal of the hand they are enjoined silence. This they as readily obey; till, at last, the whole assembly breaks up, after hearing a repetition of the same preachment."

The chief food of the monkey-tribe is fruits, the buds of trees, or succulent roots and plants. They all, like man, seem fond of sweets; and particularly the pleasant juice of the palm-tree, and the sugar-cane. With these the fertile regions in which they are bred, seldom fail to supply them; but when it happens that these fail, or that more nourishing food becomes more agreeable, they eat insects and worms; and, sometimes, if near the coasts, descend to the sea-shore, where they eat oysters, crabs, and shell-fish. The manner of managing an oyster, is extraordinary enough; but it is too well attested, to fail of our assent. As the oysters in the tropical climates are generally larger than with us, the monkeys, when they go to the sea-side, pick up a stone, and clap it between the opening shells; this prevents them from closing; and the monkey then eats the fish at his ease. They often also draw crabs from the water, by putting their tail to the hole where that animal takes refuge, and the crab fastening upon it, they withdraw it with a jerk, and thus pull their prey upon shore. This habit of laying traps for other animals, makes them very cautious of being entrapped themselves; and I am assured, by many persons of credit, that no snare, how nicely baited soever, will take the monkey of the West-India islands; for having been accustomed to the cunning of man, it opposes its natural distrust to human artifice.

The monkey generally brings forth one at a time, and sometimes two

They are rarely found to breed when brought over into Europe; but of those that do, they exhibit a very striking picture of parental affection. The male and female are never tired of fondling their young one. They instruct it with no little assiduity; and often severely correct it, if stubborn, or disinclined to profit by their example: they hand it from one to the other; and when the male has done showing his regard, the female takes her turn. When wild in the woods, the female, if she happens to have two, carries one on her back, and the other in her arms: that on her back clings very closely, clasping its hands round her neck, and its feet about her middle; when she wants to suckle it, she then alters her position; and that which has been fed gives place to the other, which she takes in her arms. It often happens that she is unable to leap from one tree to another, when thus loaden, and upon such occasions their dexterity is very surprising. The whole family form a kind of chain, locking tail in tail, or hand in hand, and one of them holding the branch above, the rest swing down, balancing to and fro, like a pendulum, until the undermost is enabled to catch hold of the lower branches of some neighbouring tree. When the hold is fixed below, the monkey lets go that which was above, and thus comes undermost in turn; but, creeping up along the chain, attains the next branches, like the rest; and thus they all take possession of the tree, without ever coming to the ground.

When in a state of domestic tameness, those animals are very amusing, and often fill up a vacant hour, when other entertainment is wanting. There are few that are not acquainted with their various mimicries, and their capricious feats of activity. But it is generally in company with other animals of a more simple disposition that their tricks and superior instincts are shown; they seem to take a delight in tormenting them, and I have seen one of them amusing itself for hours together in imposing upon the gravity of a cat. Erasmus tells us of a large monkey, kept by Sir Thomas More, that, one day diverting itself in his garden, where some tame rabbits were kept, played several of his usual pranks among them, while the rabbits scarce well knew what to make of their new acquaintance: in the mean time, a weasel, that came for very different purposes than those of entertainment, was seen peering about the place in which the rabbits were fed, and endeavouring to make its way, by removing a board that closed their hutch. While the monkey saw no danger, it continued a calm spectator of the enemy's efforts; but just when, by long labour, the weasel had effected its purpose, and had removed the board, the monkey stept in, and, with the utmost dexterity, fastened it again in its place; and the disappointed weasel was too much fatigued to renew its operations. To this I will only add what Father Carli, in his history of Angola, assures us to be true. In that horrid country, where he went to convert the savage natives to Christianity, and met with nothing but distress and disappointment; while his health was totally impaired by the raging heats of the climate, his patience exhausted by the obstinacy of the stupid natives, and his little provisions daily plundered, without redress, in such an exigency he found more faithful services from the monkeys than the men; these he had taught to attend him, to guard him whilst sleeping, against thieves and rats, to comb his head, to fetch his water; and, he asserts, that they were even more tractable than the human inhabitants of the place. It is indeed remarkable, that in those countries where the men are most barbarous and stupid, the brutes are most active and sagacious. It is in the torrid tracts, inhabited by barbarians that such various animals are found with instincts so nearly approaching reason. The savages both of Africa and America, accordingly suppose monkeys to be men; idle, slothful, rational beings; capable of speech and conversation, but obstinately dumb, for fear of being compelled to labour.

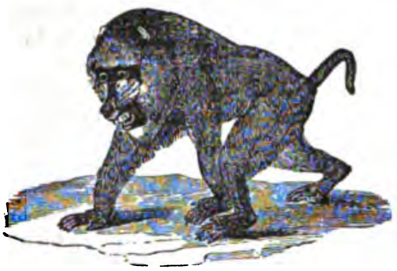
As of all savages, those of Africa are the most brutal, so, of all countries, the monkeys of Africa are the most expert and entertaining. The monkeys of America are, in general, neither so sagacious nor so tractable, nor is their form so nearly approaching that of man. The monkeys of the new continent may be very easily distinguished from those of the old by three marks. Those of the ancient continent are universally found to have a naked callous substance behind, upon which they sit; which those of America are entirely without: those also of the ancient continent have the nostrils differently formed, more resembling those of men, the holes opening downward; whereas the American monkeys have them opening on each side; those of the ancient world have pouches on each side the jaw, into which they put their provisions, which those of America are without: Lastly, none of the monkeys of the ancient continent hang by the tail, which many of the American sorts are known to do. By these marks the monkeys of either continent may be readily distinguished from each other, and prized accordingly. The African monkey, as I am assured, requires a longer education, and more correction than that of America; but it is at last found capable of more various powers of imitation, and shows a greater degree of cunning and activity.

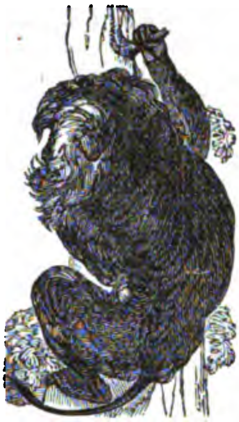
Mr. Buffon, who has examined this race of imitative beings with greater accuracy than any other naturalist before him, makes but nine species of monkeys belonging to the ancient continent; and eleven belonging to the new. To all these he gives the names which they go by, in their respective countries: which, undoubtedly, is the method least liable to error, and the most proper for imitation.

Of the monkeys of the ancient continent, the first he describes is the Mocaguo; somewhat resembling a baboon in size, strength of body and a hideous wrinkled visage: it differs, however, in having a very long tail, which is covered with tufted hair. It is a native of Congo.

The second is the Patas, which is about the same size with the former; but differs, in having a longer body, and a face less hideous; it is particularly remarkable for the colour of its hair, which is of a red, so brilliant, that the animal looks as if it were actually painted. It is usually brought from Senegal; and by some called the *red African monkey.*

The third of the ancient continent is the Malbrouk; of which he supposes the monkey which he calls the Bonet Chinois, to be a variety. The one is remarkable for a long tail, and long beard; the other for a cap of hair that covers the crown of the head, from whence it takes the name. Both are natives of the East Indies; and the Bramins, who extend their charity to all the brute creation, have hospitals for such of them as happen to be sick, or otherwise disabled.


Maimon, p. 264.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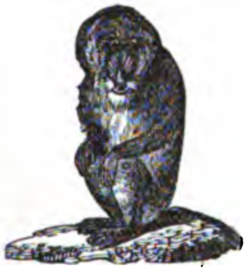
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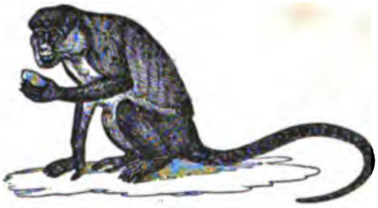
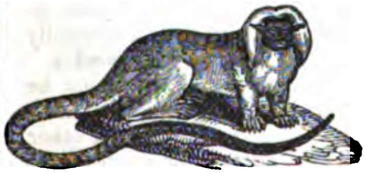

Common Monkey, p. 260.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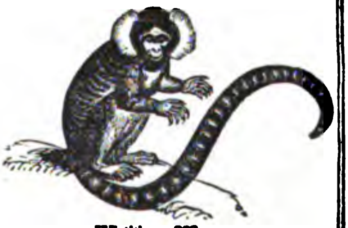

Wistiti, p. 268.

To face p. 266, vol. ii.

Black Ape, p. 249.

Baris, p. 253.

Barbary Ape, p. 249.

Black Monkey, p. 260.

To face p. 267, vol. ii.

The fourth of this kind is the Mangabey; this may be distinguished from all others by its eye-lids, which are naked, and of a striking whiteness. It is a native of Madagascar.

The fifth is the Mona, or the Cephus of the Ancients: it is distinguished by its colour, which is variegated with black and red; and its tail is of an ash-colour, with two white spots on each side at its insertion. It is a native of the northern parts of Africa.

The sixth is the Callitrix, or Green Monkey of St. Iago; distinguished by its beautiful green colour on the back, its white breast and belly, and its black face.

The seventh is the Moustoc, or White Nose: distinguished by the whiteness of its lips, from whence it has received its name, the rest of the face being of a deep blue. It is a native of the Gold Coast, and a very beautiful little animal.

The eighth is the Talapoin; and may be distinguished as well by its beautiful variety of green, white, and yellow hair, as by that under the eyes, being of a greater length than the rest. It is supposed to be a native of Africa and the East.

The ninth and last of the monkeys of the ancient continent, is the Douc, so called in Cochin-China, of which country it is a native.—The douc seems to unite the characters of all the former together with a long tail, like the monkey; of a size as large as the baboon; with a white flat face, like the ape: it even resembles the American monkeys, in having no callous on its posteriors. Thus it seems to form the shade by which the monkeys of one continent are linked with those of the other.

Next come the monkeys of the new continent; which, as hath been said, differ from those of the old, in the make of their nostrils, in their having no callosity on their posteriors, and in their having no pouches on each side of the jaw. They differ also from each other, a part of them making no use of their tails to hang by; while others of them have the tails very strong and muscular, and serving by way of a fifth hand to hold by. Those with muscular holding tails, are called Sapajous; those with feeble, useless tails, are called Sagoins. Of the Sapajous there are five sorts: of the sagoins, there are six.

The first of the sapajous is the Warine, or the Brazilian Guariba. This monkey is as large as a fox, with black, long hair, and remarkable for the loudness of its voice. It is the largest of the monkey kind to be found in America.

The second is the Coaiti; which may be distinguished from the rest by having no thumb, and, consequently, but four fingers on the two fore-paws. The tail, however, supplies the defects of the hand; and with this the animal flings itself from one tree to another with surprising rapidity.

The third is the Sajou; distinguished from the rest of the sapajous by its yellowish, flesh-coloured face.

The forth is the Sai. It is somewhat larger than the sajou, and has a broader muzzle. It is called also the Bewailer, from its peculiar manner of lamenting when either threatened or beaten.

The fifth and last of the sapajou kind, or monkeys that hold by the tail, is the Saimiri, or Aurora; which is the smallest and most beauti ful of all. It is of a fine orange colour, with two circles of flesh round the eyes. It is a very tender, delicate animal, and held in high price.

Of the sagoins with feeble tails, there are six kinds. The first and the largest is the Saki, or Cagui; so remarkable for the length of the hair on its tail, that it has been often termed the Fox-tailed Monkey It is of different sizes, some being twice as large as others.

The second of this kind is the Tamain; which is usually black, with the feet yellow. Some, however, are found all over brown, spotted with yellow.

The third is the Wistiti; remarkable for the large tufts of hair upon its face, and its annulated tail.

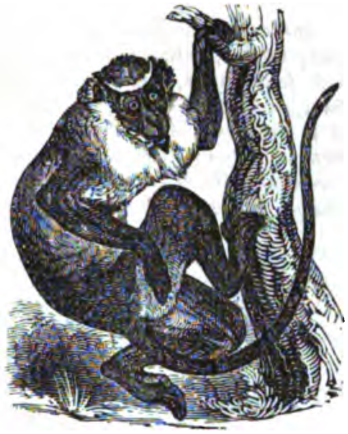
The fourth is the Marikina; with a mane round the neck, and a bunch of hair at the end of the tail, like a lion.

The fifth is called the Pinch; with the face of a beautiful black, and white hair that descends on each side of the face, like that of a man.

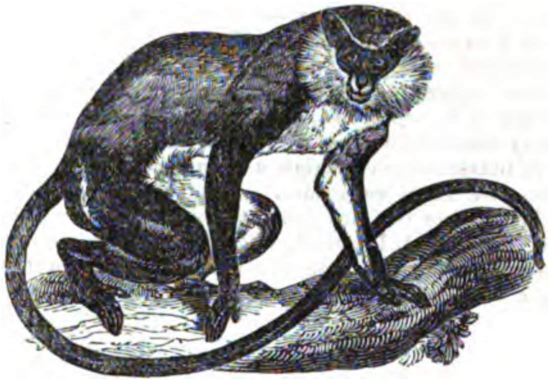
The last, least, and most beautiful of all, is the Mico, an animal too curiously adorned not to demand a particular description; which is thus given of it by Mr. Condamine:—"That," says he, "which the Governor of Para made me a present of, was the only one of its kind that was seen in the country. The hair on its body was of a beautiful silver colour, brighter than that of the most venerable human hair: while the tail was of a deep brown, inclining to blackness. It had another singularity more remarkable than the former; its ears, its cheeks, and lips were tinctured with so bright a vermilion, that one could scarce be led to suppose that it was natural I kept it a year; and it was still alive when I made this description of it, almost within sight of the coasts of France: all I could then do, was to preserve it in spirits of wine, which might serve to keep it in such a state as to show that I did not in the least exaggerate in my description."

OF THE MAKI.

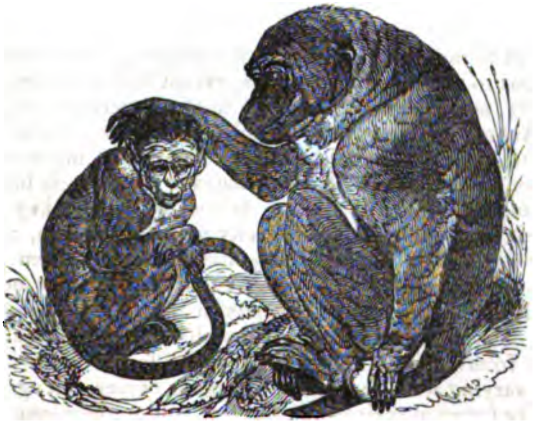
The last of the monkey kind are the makies; which have no other pretensions to be placed in this class, except that of having hands like the former, and making use of them to climb trees, or to pluck their food. Animals of the hare kind, indeed, are often seen to feed themselves with their fore-paws, but they can hold nothing in one of them singly, and are obliged to take up whatever they eat in both at once but it is otherwise with the maki; as well as the monkey kinds, they seize their food with one hand, pretty much like a man, and grasp it with great ease and firmness. The maki, therefore, from this conformation in its hands, both before and behind, approaches nearly to the monkey kind; but, in other respects, such as the make of the snout the form of the ears, and the parts that distinguish the sexes, it entirely differs from them. There are many different kinds of these animals, all varying from each other in colour or size, but agreeing in the human-like figure of their hands and feet, and in their long nose, which



Congo, or Diana Monkey, p. 266.

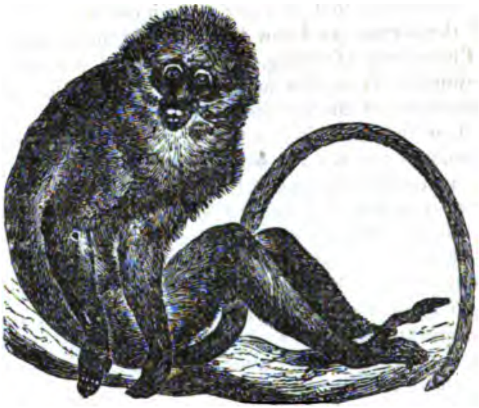


Mona Monkey, p. 267.

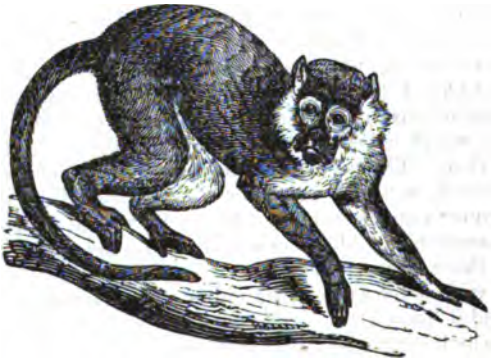


Malbrouk, or Bonet Chinois, and Pigfaced Baboon, p. 268.

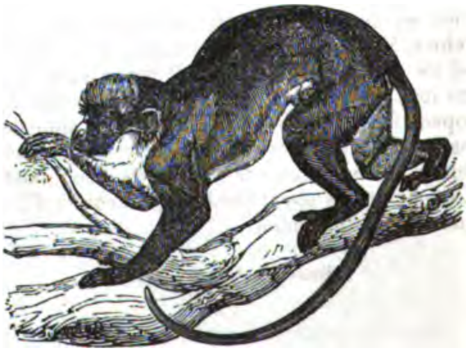
To face p. 268, vol. ii.



Mangabey, or White Eyelid Monkey, p. 267.



Red Monkey, p. 266.



White-nosed Monkey, p. 267.

To face p. 269, vol. ii.

somewhat resembles that of a dog. As most of these are bred in the depths of the forest, we know little more concerning them than their figure. Their way of living, their power of pursuit and escape, can only be supposed, from the analogy of their conformation, somewhat to resemble those of the monkey.

The first of this kind is the Mococo; a beautiful animal about the size of a common cat, but the body and limbs slenderer, and of a longer make. It has a very long tail, at least double the length of its body; it is covered with fur, and marked alternately with broad rings of black and white. But what it is chiefly remarkable for, besides the form of its hands and feet, is the largeness of its eyes, which are surrounded with a broad, black space; and the length of the hinder legs, which by far exceed those before. When it sleeps, it brings its nose to its belly, and its tail over its head. When it plays, it uses a sort of gallopping, with its tail raised over its back, which keeps continually in motion. The head is covered with a dark ash-coloured hair; the back and sides with a red ash-colour, and not so dark as on the head; and the whole glossy, soft, and delicate, smooth to the touch, and standing almost upright like the pile of velvet. It is a native of Madagascar; appears to be a harmless, gentle animal; and though it resembles the monkey in many respects, yet it has neither its malice nor its mischief: nevertheless, like the monkey it seems to be always in motion, and moves like all four-handed animals, in an oblique direction.

A second of this kind, which is also a native of Madagascar, is the Mongoz; which is less than the former; with a soft, glossy robe, but a little curled. The nose also is thicker than that of the mococo; the eyes are black, with orange-coloured circles round the pupil; and the tail is of one uniform colour. As to the rest, it is found of various colours; some being black, others brown; and its actions somewhat resemble those of a monkey.

The Vari is much larger than either of the former; its hair is much longer, and it has a kind of ruff round the neck, consisting of very long hair, by which it may be easily distinguished from the rest. It differs also in its disposition, which is fierce and savage; as also in the loudness of its voice, which somewhat resembles the roaring of the lion.—This also is a native of Madagascar.

To this tribe we may refer a little four-handed animal, of the island of Ceylon, which Mr. Buffon calls the Lori; very remarkable for the singularity of its figure. This is, of all other animals, the longest in proportion to its size; having nine vertebræ in the loins; whereas other quadrupeds have only seven*. The body appears still the longer by having no tail. In other respects, it resembles those of the maki kind; as well in its hands and feet, as in its snout, and in the glossy qualities of its hair. It is about the size of a squirrel; and appears to be a tame, harmless little animal.

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* Buffon, vol. xxvi. p. 274.

OF THE OPOSSUM AND ITS KINDS

To these four-handed animals of the ancient continent, we may add the four-handed animals of the new, that use their hands like the former, as well as their tails, and that fill up the chasm between the monkey tribe and the lower orders of the forest. As the maki kind in some measure seem to unite the fox and the monkey in their figure and size, so these seem to unite the monkey and the rat. They are all less than the former; they have long tails, almost bare of hair; and their fur, as well as their shape, seems to place them near the rat kind.—Some have accordingly ranked them in that class; but their being four-handed is a sufficient reason for placing them in the rear of the monkeys.

The first, and the most remarkable of this tribe is the Opossum, an animal found both in North and South America, of the size of a small cat. The head resembles that of a fox; it has fifty teeth in all; but two great ones in the midst, like those of a rat. The eyes are little, round, clear, lively, and placed upright; the ears are long, broad, and transparent, like those of the rat kind; its tail also increases the similitude, being round, long, a little hairy in the beginning, but quite naked towards the end. The fore-legs are short, being about three inches long, while those behind are about four. The feet are like hands, each having five toes or fingers with white crooked nails, and rather longer behind than before. But it is particular in this animal that the thumb on the hinder-legs wants a nail; whereas the fingers are furnished with clawed nails as usual.

But that which distinguishes this animal from all others, and what has excited the wonder of mankind for more than two centuries, is the extraordinary conformation of its belly, as it is found to have a false womb, into which the young, when brought forth in the usual manner, creep, and continue for some days longer, to lodge and suckle securely. This bag, if we may so call it, being one of the most extraordinary things in natural history, requires a more minute description. Under the belly of the female is a kind of slit or opening, of about three inches long; this opening is composed of a skin, which makes a bag internally, that is covered on the inside with hair, and in this bag are the teats of the female; and into it the young, when brought forth, retire, either to suckle or to escape from danger. This bag has a power of opening and shutting, at the will of the animal; and this is performed by means of several muscles, and two bones, that are fitted for this purpose, and that are peculiar to this animal only. These two bones are placed before the *os pubis*, to which they are joined at the base; they are about two inches long, and grow smaller and smaller to their extremities. These support the muscles that serve to open the bag, and give them a fixture. To these muscles there are antagonists, that serve in the same manner to shut the bag; and this they perform so exactly, that in the living animal the opening can scarce be discerned, except when the sides are forcibly drawn asunder. The inside of this bag is furnished with glands, that exude a musky substance, which communicates to the flesh of the animal, and renders it unfit to be eaten. It is not to be supposed that this is the place where the young are conceived, as some have been led to imagine ; for the opossum has another womb, like that of the generality of animals, in which generation is performed in the ordinary manner The bag we have been describing may rather be considered as a supplemental womb. In the real womb, the little animal is partly brought to perfection ; in the false one, it receives a kind of additional incubation ; and acquires, at last, strength enough to follow the dam wherever she goes. We have many reasons to suppose that the young of this animal are all brought forth prematurely, or before they have acquired that degree of perfection which is common in other quadrupeds. The little ones, when first produced, are in a manner but half completed ; and some travellers assert, that they are at that time not much larger than flies. We are assured also, that immediately on quitting the real womb, they creep into the false one ; where they continue fixed to the teat, until they have strength sufficient to venture once more into the open air, and share the fatigues of the parent. Ulloa assures us, that he has found five of these little creatures hidden in the belly of the dam three days after she was dead, still alive, and all clinging to the teat with great avidity. It is probable, therefore, that upon their first entering the false womb, they seldom stir out from thence ; but when more advanced, they venture forth several times in the day, and, at last, seldom make use of their retreat, except in cases of necessity or danger. Travellers are not agreed in their accounts of the time which these animals take to continue in the false womb ; some assure us they remain there for several weeks ; others, more precisely, mention a month. During this period of strange gestation, there is no difficulty in opening the bag in which they are concealed ; they may be reckoned, examined, and handled, without much inconvenience; for they keep fixed to the teat, and cling there as firm as if they made a part of the body of the animal that bears them. When they are grown stronger, they drop from the teat into the bag in which they are contained ; and at last find their way out, in search of more copious subsistence. Still, however, the false belly serves them for a retreat, either when they want to sleep or to suckle, or when they are pursued by an enemy. The dam, on such occasions, opens her bag to receive them, which they enter.

——————————————Pars formidine turvi
Scandunt rursus equum et nota conduntur in alvo.

The opossum, when on the ground, is a slow, helpless animal ; the formation of its hands are alone sufficient to show its incapacity of running with any degree of swiftness ; but to counterbalance this inconvenience, it climbs trees with great ease and expedition.* It chiefly subsists upon birds ; and hides among the leaves of the trees, to seize them by surprise. It often also hangs by the tail, which is long and muscular ; and, in this situation, for hours together, with the head downwards, it keeps watching for its prey. If any lesser animal, which

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Buffon, vol. xxi. p. 174.

it is able to overcome, passes underneath, it drops upon it with deadly aim, and quickly devours it. By means of its tail, the opossum also slings from one tree to another, hunts insects, escapes its pursuers and provides for its safety. It seems to be a creature that lives upon vegetables, as well as animal substances, roots, sugar-canes, the bark, and even the leaves of trees. It is easily tamed, but it is a disagreeable domestic, as well from its stupidity and figure, as its scent, which, however fragrant in small quantities, fails not to be ungrateful when copiously supplied.

An animal greatly resembling the former,* is the Marmose, which is found in the same continent. It seems only to differ in size, being less; and, instead of a bag to receive its young, has only two longitudinal folds near the thighs, within which the young, which are prematurely brought forth, as in the last instance, continue to suckle. The young of these, when first produced, are not above the size of a bean; but continue sticking to the teat, until they have arrived at greater maturity.

The Cayopolin is somewhat larger than the former, and a good deal resembling it in habits and figure, except that its snout is more pointed, its tail is longer in proportion, and its colour is different, being of an ash, somewhat inclining to yellow; however, I should suppose it to be only a variety of the former.

To this number we may add the Phalanger, so called by Mr. Buffon, a good deal resembling the former, but distinguished by the fashion of its hinder hands; the thumb and fore-finger being joined together, except at the extremities. This animal is about the size of a rat; and has, accordingly, by some, been called the Rat of Surinam.

The last animal of this class is called by Mr. Buffon, the Tarsier. This extraordinary little animal resembles the former, in having four hands, and a long tail; but it differs very much in the extreme length of its hinder legs, which are longer than the rest of its whole body. The bones of that part of the foot called the *tarsus*, are likewise so very long, that from thence the animal has received its name: the tail is naked in the middle, and hairy only at both extremities: its hair is woolly, soft, and of a deep ash-colour. As to the rest, it is unknown from what country this animal was brought; but the naturalist, from whom we have this description, supposes it to be a native of America.

From this general description of four-handed animals, we perceive what few advantages the brute creation derive from those organs that, in man, are employed to so many great and useful purposes. The being able to pluck their food from the trees, the capacity of clinging among the branches, and at most, of converting one of those branches into a weapon of defence, are the highest stretches of their sagacity, and the only use their hands have hitherto been employed in: and yet some superficial men have asserted, that the hands alone are sufficient to vindicate the dominion of mankind over other animals; and that much of his boasted reason is nothing more than the result of his happier conformation: however, were this so, an ape or a monkey would in some instances be more rational than we; their fingers are smaller and in some of them more finely formed than ours. To what a variety of purposes might they not be employed, if their powers were properly exerted! Those works which we, from the largeness of our fingers, are obliged to go clumsily about, one of these could very easily perform with the utmost exactness; and if the fineness of the hand assisted reason, an ape would be one of the most reasonable beings in creation. But these admirably formed machines, are almost useless both to mankind and themselves: and contribute little more to the happiness of animal life, than the paws of the lowest quadruped. They are supplied indeed with the organs, but they want the mind, to put them into action: it is that reasoning principle alone with which man has been endowed, that can adapt seemingly opposite causes, to concur in the same general design, and even where the organs are deficient that can supply their place by the intervention of assisting instruments. Where reason prevails, we find that it scarcely matters what the organs are that give it the direction; the being furnished with that principle still goes forward, steadily, and uniformly successful; breaks through every obstacle, and becomes master of every enterprise. I have seen a man, without hands or legs, convert, by practice, his very stumps to the most convenient purposes; and with these clumsy instruments perform the most astonishing feats of dexterity. We may therefore conclude, that it is the mind alone that gives a master to the creation; and that, if a bear or a horse were endowed with the same intellects that have been given to man, the hardness of a hoof, or the awkwardness of a paw, would be no obstacle to their advancement in the arts of dominion, or of social felicity.

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* Buffon, vol. xxxi. p. 212.

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CHAPTER II.

OF THE ELEPHANT.

HAVING gone through the description of those quadrupeds that by resembling each other in some striking particular, admit of being grouped together, and considered under one point of view, we now come to those insulated sorts that bear no similitude with the rest, and that to be distinctly described, must be separately considered.

The foremost of these, and in every respect the noblest quadruped in Nature, is the Elephant, not less remarkable for its size than its docility and understanding. All historians concur in giving it the character of the most sagacious animal next to man; and yet, were we to take our idea of its capacity from its outward appearance, we should be led to conceive very meanly of his abilities. The elephant, at first view, presents the spectator with an enormous mass of flesh that seems scarcely animated. Its huge body, covered with a callous hide, without hair; its large misshapen legs, that seem scarcely formed for motion; its little eyes, large ears, and long trunk, all give it an air of extreme stupidity. But our prejudices will soon subside when we com-to examine its history; they will even serve to increase our surprise when we consider the various advantages it derives from so clumsy a conformation.

The elephant is seen from seven to no less than fifteen feet high. Whatever care we take to imagine a large animal before hand, yet the first sight of this huge creature never fails to strike us with astonishment, and in some measure to exceed our idea. Having been used to smaller animals, we have scarce any conception of its magnitude; for a moving column of flesh, fourteen feet high, is an object so utterly different from those we are constantly presented with, that to be conceived, it must be actually seen. Such, I own were the suggestions that naturally arose to me when I first saw this animal, and yet for the sight of which I had taken care to prepare my imagination. I found my ideas fall as short of its real size, as they did of its real figure; neither the pictures I had seen, nor the description I had read, giving me adequate conceptions of either.

It would, therefore, be impossible to give an idea of this animal's figrure by a description; which, even assisted by the art of the engraver. will but confusedly represent the original. In general it may be observed, that the forehead is very high and rising, the ears very large and dependent, the eyes extremely small, the proboscis, or trunk, long, the body round and full, the back rising in an arch, and the whole animal short in proportion to its height. The feet are round at the bottom; on each foot there are five flat horny risings, which seem to be the extremities of the toes, but do not appear outwardly. The hide is without hair, full of scratches and scars, which it receives in its passage through thick woods and thorny places. At the end of the tail there is a tuft of hair, a foot and a half long. The female is less than the male, and the udder is between the fore-legs. But a more accurate, as well as a more entertaining description of the parts, will naturally occur in the history of their uses.

Of all quadrupeds, the elephant is the strongest, as well as the largest; and yet, in a state of Nature, it is neither fierce nor formidable[*] Mild, peaceful, and brave, it never abuses its power or its strength, and only uses its force for its own protection, or that of its community. In its native deserts, the elephant is seldom seen alone, but appears to be a social, friendly creature. The oldest of the company conducts the band; that which is next in seniority brings up the rear. The young, the weak, and the sickly, fall into the centre: while the females carry their young, and keep them from falling, by means of their trunks. They maintain this order only in dangerous marches, or when they desire to feed in cultivated grounds; they move with less precaution in the forest and solitudes; but without ever separating, or removing so far asunder as to be incapable of lending each other any requisite assistance. Nothing can be more formidable than a drove of elephants as they appear at a distance in an African landscape; wherever they march, the forests seem to fall before them; in their passage, they bear down the branches upon which they feed; and if they enter into an inclosure, they destroy all the labours of the husbandman in a very short time. Their invasions are the more disagreeable, as there is no means of repelling them; since it would require a small army to attack the whole drove when united. It now and then happens that one or two are found lingering behind the rest, and it is against these that the art and force of the hunters are united; but an attempt to molest the whole body would certainly be fatal. They go forward directly against him who offers the insult, strike him with their tusks, seize him with their trunks, fling him into the air, and then trample him to peices under their feet. But they are thus dreadful only when offended, and do no manner of personal injury when suffered to feed without interruption. It is even said that they are mindful of injuries received; and, when once molested by man, seek all occasions for the future to be revenged; they smell him with their long trunks at a distance; follow him with all their speed upon the scent; and, though slow to appearance, they are soon able to come up with and destroy him.

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[*] I have extracted the greatest part of this description from Mr. Buffon. Where add. I mark with commas, "thus."

In their natural state, they delight to live along the sides of rivers, to keep in the deepest vales, to refresh themselves in the most shady forests and watery places. They cannot live far from the water; and they always disturb it before they drink. They often fill their trunk with it, either to cool that organ, or to divert themselves by spurting it out like a fountain. They are equally distressed by the extremes of heat and cold; and, to avoid the former, they frequently take shelter in the most obscure recesses of the forest, or often plunge into the water, and even swim from the continent into islands some leagues distant from the shore.

Their chief food is of the vegetable kind, for they loathe all kind of animal diet. When one among their number happens to light upon a spot of good pasture, he calls the rest, and invites them to share in the entertainment; but it must be a very copious pasture indeed that can supply the necessities of the whole band. As with their broad and heavy feet they sink deep wherever they go, they destroy much more than they devour; so that they are frequently obliged to change their quarters, and to migrate from one country to another. The Indians and Negroes, who are often incommoded by such visitants, do all they can to keep them away, making loud noises, and large fires round their cultivated grounds; but these precautions do not always succeed; the elephants often break through their fences, destroy their whole harvest, and overturn their little habitations. When they have satisfied themselves, and trod down or devoured whatever lay in their way, they then retreat into the woods in the same orderly manner in which they made their irruption.

Such are the habits of this animal considered in a social light; and, if we regard it as an individual, we shall find its powers still more extraordinary. With a very awkward appearance, it possesses all the senses in great perfection, and is capable of applying them to more useful purposes than any other quadruped. The elephant, as we observed, has very small eyes, when compared to the enormous bulk of its body. But though their minuteness may at first sight appear deformed, yet when we come to examine them, they are seen to exhibit a variety of expression, and to discover the various sensations with which it is moved. It turns them with attention and friendship to its master, it seems to reflect and deliberate; and as its passions slowly succeed each other, their various workings are distinctly seen.

The elephant is not less remarkable for the excellence of its hearing. Its ears are extremely large, and greater in proportion than even those of an ass. They are usually dependent; but it can readily raise and move them. They serve also to wipe its eyes, and to protect them against the dust and flies that might otherwise incommode them. It appears delighted with music, and very readily learns to beat time, to move in measure, and even to join its voice to the sound of the drum and the trumpet.

This animal's sense of smelling is not only exquisite, but it is in a great measure pleased with the same odours that delight mankind. The elephant gathers flowers with great pleasure and attention; it picks them up one by one, unites them into a nosegay, and seems charmed with the perfume. The orange-flower seems to be particularly greatful both to its sense of taste and smelling; it strips the tree of all its verdure, and eats every part of it, even to the branches themselves. It seeks in the meadows the most odoriferous plants to feed upon; and in the woods, it prefers the cocoa, the banana, the palm, and the saga tree, to all others. As the shoots of these are tender and filled with pith; it eats not only the leaves and the fruits, but even the branches, the trunk, and the whole plant to the very roots.

But it is in the sense of touching that this animal excels all others of the brute creation, and perhaps even man himself. The organ of this sense lies wholly in the trunk, which is an instrument peculiar to this animal, and that serves it for all the purposes of a hand. The trunk is, properly speaking, only the snout lengthened out to a great extent, hollow like a pipe, and ending in two openings, or nostrils, like those of a hog. An elephant of fourteen feet high has the trunk about eight feet long, and five feet and a half in circumference at the mouth, where it is thickest. It is hollow all along, but with a partition running from one end of it to the other; so that though outwardly it appears like a single pipe, it is inwardly divided into two. This fleshy tube is composed of nerves and muscles, covered with a proper skin of a blackish colour, like that of the rest of the body. It is capable of being moved in every direction, of being lengthened and shortened, of being bent or straightened, so pliant as to embrace any body it is applied to, and yet so strong that nothing can be torn from the gripe. To aid the force of this grasp, there are several little eminences, like a caterpillar's feet, on the underside of this instrument, which without doubt contribute to the sensibility of the touch as well as the firmness of the hold. Through this trunk the animal breathes, drinks, and smells, as through a tube; and at the very point of it, just above the nostrils, there is an extension of the skin, about five inches long, in the form of a finger, and which, in fact, answers all the purposes of one; for, with the rest of the extremity of the trunk, it is capable of assuming different forms at will, and consequently of being adapted to the minutest objects. By means of this, the elephant can take a pin from the ground, untie the knots of a rope, unlock a door, and even write with a pen. "I hav myself seen" says Ælian, "an elephant writing Latin characters on a board, in a very orderly manner, his keeper only showing him the figure of each letter. While thus employed, the eyes might be observed studiously cast down upon the writing, and exhibiting an appearance of great skill and erudition." It sometimes happens that the object is too large for the trunk to grasp; in such a case the elephant makes use of another expedient, as admirable as any of the former. It applies the extremity of the trunk to the surface of the object, and, sucking up its breath, lifts and sustains such a weight as the air in that case is capable of keeping suspended. In this manner this instrument is useful in most of the purposes of life; it is an organ of smelling, of touching, and of suction; it not only provides for the animal's necessities and comforts, but it also serves for its ornament and defence.

But though the elephant be thus admirably supplied by its trunk, yet with respect to the rest of its conformation, it is unwieldy and helpless. The neck is so short that it can scarce turn the head, and must wheel round in order to discover an enemy from behind. The hunters that attack it upon that quarter, generally thus escape the effects of its indignation, and find time to renew their assaults while the elephant is turning to face them. The legs are, indeed, not so inflexible as the neck, yet they are very stiff, and bend not without difficulty. Those before seem to be longer than the hinder; but upon being measured, are found to be something shorter. The joints by which they bend, are nearly in the middle, like the knee of a man; and the great bulk which they are to support makes their flexure ungainly. While the elephant is young, it bends the legs to lie down or to rise, but when it grows old, or sickly, this is not performed without human assistance; and it becomes, consequently, so inconvenient, that the animal chooses to sleep standing. The feet, upon which these massy columns are supported, form a base scarce broader than the legs they sustain. They are divided into five toes, which are covered beneath the skin, and none of which appear to the eye; a kind of protuberance like claws are only observed, which vary in number from three to five The apparent claws vary; the internal toes are constantly the same. The sole of the foot is furnished with a skin as thick and hard as horn, and which completely covers the whole under-part of the foot.

To the rest of the elephant's incumbrances may be added its enormous tusks, which are unserviceable for chewing, and are only weapons of defence. These, as the animal grows old, become so heavy that it is sometimes obliged to make holes in the walls of its stall to rest them in, and ease itself in the fatigue of their support. It is well known to what an amazing size these tusks grow; they are two in number, proceeding from the upper jaw, and are sometimes found above six feet long. Some have supposed them to be rather the horns than the teeth of this animal; but, besides their greater similitude to bone than to horn, they have been indisputably found to grow from the upper jaw, and not from the frontal bones, as some have thought proper to assert.* Some also have asserted, that these tusks are shed in the same manner as the stag sheds his horns; but it is very probable from their solid consistence, and from their accidental defects, which often appear to be the effect of a slow decay, that they are as fixed as the teeth of other animals are generally found to be. Certain it is, that the elephant never sheds them in a domestic state, but keeps them till they become inconvenient and encumbersome to the last degree. An account of uses to which these teeth are applied, and the manner of choosing the best ivory, belongs rather to a history of the arts than of Nature.

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* See Mr. Daubenton's description of the skeleton of this animal.

This animal is equally singular in other parts of its conformation; the lips and the tongue in other creatures serve to suck up and direct their drink or their food; but in the elephant they are totally inconvenient for such purposes; and it not only gathers its food with its trunk, but supplies itself with water by the same means. When it eats hay, as I have seen it frequently, it takes up a small wisp of it with the trunk, turns and shapes it with that instrument for some time, and then directs it into the mouth, where it is chewed by the great grinding teeth, that are large in proportion to the bulk of the animal. This pacquet, when chewed, is swallowed, and never ruminated again as in cows or sheep, the stomach and intestines of this creature more resembling those of a horse. Its manner of drinking is equally extraordinary. For this purpose the elephant dips the end of its trunk into the water, and sucks up just as much as fills that great fleshy tube completely. It then lifts up its head with the trunk full, and turning the point into its mouth, as if it intended to swallow trunk and all, it drives the point below the opening of the wind-pipe. The trunk being in this position and still full of water, the elephant then blows strongly into it at the other end, which forces the water it contains into the throat, down which it is heard to pour with a loud gurgling noise, which continues till the whole is blown down. From this manner of drinking, some have been led into an opinion that the young elephant sucks with its trunk and not with its mouth; this, however, is a fact which no traveller has hitherto had an opportunity of seeing, and it must be referred to some future accident to determine.

The hide of the elephant is as remarkable as any other part. It is not covered over with hair, as in the generality of quadrupeds, but is nearly bare. Here and there, indeed, a few bristles are seen growing in the scars and wrinkles of the body, and very thinly scattered over the rest of the skin; but in general the head is dry, rough and wrinkled, and resembling more the bark of an old tree than the skin of an animal. This grows thicker every year; and by a constant addition of substance, it at length contracts that disorder well known by the name of the elephantiasis, or Arabian leprosy; a disease to which man, as well the elephant, is often subject. In order to prevent this, the Indians rub the elephant with oil, and frequently bathe it to preserve its pliancy. To the inconveniences of this disorder is added another, arising from the great sensibility of those parts which are not callous. Upon these the flies settle in great abundance, and torment this animal unceasingly; to remedy which, the elephant tries all its arts; using not only its tail and trunk in the natural manner to keep them off, but even takes the branch of a tree, or a bundle of hay to strike them off with. When this fails, it often gathers up the dust with its trunk, and thus covers all the sensible places. In this manner it has been seen to dust itself several times a day, and particularly upon leaving the bath.

Water is as necessary to this animal as food itself. When in a state of Nature, the elephant rarely quits the banks of the river, and often stands in water up to the belly. In a state of servitude, the Indians take equal care to provide a proper supply; they wash it with great address; they give it all the conveniences for lending assistance to itself; they smooth the skin with a pumice-stone, and then rub it over with oils, essences, and odours.

It is not to be wondered at that an animal furnished with so many various advantages, both of strength, sagacity, and obedience, should be taken into the service of man. We accordingly find that the elephant, from time immemorial, has been employed either for the purposes of labour, of war, or of ostentation; to increase the grandeur of eastern princes, or to extend their dominions. We have hitherto been describing this animal in its natural state; we now come to consider it in a different view, as taken from the forest and reduced to human obedience. We are now to behold this brave, harmless creature as learning a lesson from mankind, and instructed by him in all the arts of war, massacre, and devastation. We are now to behold this half-reasoning animal led into the field of battle, and wondering at those tumults, and that madness which he is compelled to increase. The elephant is a native of Africa and Asia, being found neither in Europe nor America In Africa he still retains his natural liberty. The savage inhabitants of that part of the world, instead of attempting to subdue this powerful creature to their necessities, are happy in being able to protect themselves from his fury. Formerly, indeed, during the splendour of the Carthaginian empire, elephants were used in their wars; but this was only a transitory gleam of human power in that part of the globe; the natives of Africa have long since degenerated, and the elephant is only known among them from his devastations. However, there are no elephants in the northern parts of Africa at present, there being none found on this side of Mount Atlas. It is beyond the river Senegal that they are to be met with in great numbers, and so down to the Cape of Good Hope, as well as in the heart of the country. In this extensive region they appear to be more numerous than in any other part of the world. They are there less fearful of man; less retired into the heart of the forests, they seem to be sensible of his impotence and ignorance; and often come down to ravage his little labours. They treat him with the same haughty disdain which they show to other animals, and consider him as a mischievous little being, that fears to oppose them openly.

But although these animals are most plentiful in Africa, it is only in Asia that the greatest elephants are found, and rendered subservient to human command. In Africa, the largest do not exceed ten feet high; in Asia they are found from ten to fifteen. Their price increases in proportion to their size; and when they exceed a certain bulk, like jewels, their value then rises as the fancy is pleased to estimate.

The largest are entirely kept for the service of princes; and are maintained with the utmost magnificence, and at the greatest expense. The usual colour of the elephant is a dusky black, but some are said to be white; and the price of one of these is inestimable. Such a one is peculiarly appropriated for the monarch's own riding; he is kept in a palace, attended by the nobles, and almost adored by the people.* Some have said that these white elephants are larger than the rest;† others assert that they are less; and still others entirely doubt their existence.

As the art of war is but very little improved in Asia, there are few princes of the East who do not procure and maintain as many elephants as they are able, and place great confidence on their assistance in an engagement. For this purpose they are obliged to take them wild in their native forests, and tame them; for the elephant never breeds in a state of servitude. It is one of the most striking peculiarities in this extraordinary creature, that his generative powers totally fail when he comes under the dominion of man; as if he seemed unwilling to propagate a race of slaves to increase the pride of his conqueror. There is, perhaps, no other quadruped that will not breed in its own native climates, if indulged with a moderate share of freedom; and we know that many of them will copulate in every climate. The elephant alone has never been seen to breed; and though he has been reduced under the obedience of man for ages, the duration of pregnancy in the female still remains a secret.‡ Aristotle, indeed, asserts, that she goes two years with young; that she continues to suckle her young for three years, and that she brings forth but one at a time: but he does not inform us of the manner in which it was possible for him to have his information. From authorities equally doubtful, we learn, that the little one is about as large as a wild boar the instant it is brought forth; that its tusks do not yet appear; but that all the rest of its teeth are apparent; that at the age of six months, it is as large as an ox, and its tusks pretty well grown; and that it continues in this manner for near thirty years, advancing to maturity. All this is doubtful; but it is certain that, in order to recruit the numbers which are consumed in war, the princes of the East are every year obliged to send into the forests, and to use various methods to procure a fresh supply. Of all these numerous bands, there is not one that has not been originally wild; nor one that has not been forced into a state of subjection. Men themselves are often content to propagate a race of slaves, that pass down in this wretched state through successive generations: but the elephant, under subjection, is unalterably barren; perhaps from some physical causes, which are as yet unknown.

The Indian princes having vainly endeavoured to multiply the breed of the elephants, like that of other animals, have been at last content to separate the males from the females, to prevent those accesses of desire, which debilitated without multiplying the species. In order to take them wild in the woods, a spot of ground is fixed upon, which is surrounded with a strong palisade. This is made of the thickest and the strongest trees; and strengthened by cross bars, which give firmness to the whole. The posts are fixed at such distances from each other, that a man can easily pass between them; there being only one great passage left open, through which an elephant can easily come; and which is so contrived as to shut behind, as soon as the beast is entered To draw him into this inclosure, it is necessary first to find him out in the woods; and a female elephant is conducted along into the heart of the forest, where it is obliged by its keeper to cry out for the male. The male very readily answers the cry, and hastens to join her; which the keeper perceiving, obliges her to retreat, still repeating the same cry, until she leads the animal into the inclosure already described, which shuts the moment he is entered. Still, however, the female proceeds calling and inviting, while the male proceeds forward in the inclosure, which grows narrower all the way, and until the poor animal finds himself completely shut up, without the power of either advancing or retreating; the female in the mean time, being let out by a private way, which she has been previously accustomed to. The wild elephant, upon seeing himself entrapped in this manner, instantly attempts to use violence; and, upon seeing the hunters, all his former desires only turn to fury. In the mean time, the hunters, having fixed him with cords, attempt to soften his indignation, by throwing buckets of water upon him in great quantities, rubbing the body with leaves, and pouring oil down his ears. Soon after, two tame elephants are brought, a male and a female, that caress the indignant animal with their trunks; while they still continue pouring water to refresh it. At last a tame elephant is brought forward, of that number which is employed in instructing the new-comers, and an officer riding upon it, in order to show the late captive that it has nothing to fear. The hunters then open the inclosure; and while this creature leads the captive along, two more are joined on either side of it, and these compel it to submit. It is then tied by cords to a massy pillar, provided for that purpose, and suffered to remain in that position for about a day and a night, until its indignation be wholly subsided. The next day it begins to be somewhat submissive; and in a fortnight is completely tamed like the rest. The females are taken when accompanying the males; they often come into these inclosures, and they shortly after serve as decoys to the rest. But this method of taking the elephant differs, according to the abilities of the hunter; the Negroes of Africa, who hunt this animal merely for its flesh, are content to take it in pit-falls; and often to pursue it in the defiles of a mountain, where it cannot easily turn, and so wound it from behind till it falls.

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* P. Vincent Marie. † P. Tachard.

‡ Multis persuasum est elephantem non brutorum sed hominum more coire. Quod retro mingit non dubitatur. Sed ipse vidi marem hujusce speciei, in nostri regis stabulis super fœmellam itidem inclusam quadrupedem more salientem, pene paululum incurvato sed sufficienter recto

The elephant, when once tamed, becomes the most gentle and obedient of all animals. It soon conceives an attachmet for the person that attends it, caresses him, obeys him, and seems to anticipate his desires In a short time it begins to comprehend several of the signs made to it, and even the different sounds of the voice; it perfectly distinguishes the tone of command from that of anger or approbation, and it acts accordingly. It is seldom deceived in its master's voice; it receives his orders with attention, and executes them with prudence, eagerly, yet without precipitation. All its motions are regulated; and its actions seem to partake of its magnitude; being grave, majestic, and secure. It is quickly taught to kneel down to receive its rider; it caresses those it knows with its trunk; with this salutes such as it is ordered to distinguish, and with this, as with a hand, helps to take up a part of its load. It suffers itself to be arrayed in harness, and seems to take a pleasure in the finery of its trappings. It draws either chariots, cannon, or shipping, with surprising strength and perseverance; and this with a seeming satisfaction, provided that it be not beaten without a cause, and that its master appears pleased with its exertions.

The elephant's conductor is usually mounted upon its neck, and makes use of a rod of iron to guide it, which is sometimes pointed, and at others bent into a hook. With this the animal is spurred forward when dull or disobedient; but, in general, a word is sufficient to put the gentle creature into motion, especially when it is acquainted with its conductor. This acquaintance is often perfectly necessary; for the elephant frequently takes such an affection to its keeper, that it will obey no other: and it has been known to die for grief, when, in some sudden fit of madness, it has killed its conductor. We are told, that one of these, that was used by the French forces in India for the drawing their cannon, was promised by the conductor a reward for having performed some painful service; but being disappointed of its expectations, it slew him in a fury. The conductor's wife, who was a spectator of this shocking scene, could not restrain her madness and despair; but running with her two children in her arms, threw them at the elephant's feet, crying out, that since it had killed her husband, it might kill her and her children also. The elephant seeing the children at his feet, instantly stopped, and moderating its fury, took up the eldest with its trunk, and placing him upon its neck, adopted him for its conductor, and obeyed him ever after with great punctuality.

But it is not for drawing burdens alone, that the elephants are serviceable in war; they are often brought into the ranks, and compelled to fight in the most dangerous parts of the field of battle. There was a time, indeed, in India, when they were much more used in war than at present. A century or two ago, a great part of the dependence of the general was upon the number and the expertness of his elephants; but of late, since war has been contented to adopt fatal instead of formidable arts the elephant is little used, except for drawing cannon, or transporting provisions. The princes of the country are pleased to keep a few for ornament, or for the purposes of removing their seraglios: but they are seldom led into a field of battle, where they are unable to withstand the discharge of fire-arms, and have often been found to turn upon their employers. Still, however, they are used in war, in the more remote parts of the east; in Siam, in Cochin-China, in Tonquin, and Pegu. In all these places, they not only serve to swell the pomp of state, being adorned with all the barbarian splendour that those countries can bestow, but they are actually led into the field of battle, armed before with coats of mail, and loaded on the back each with a square tower, containing from five to seven combatants. Upon its neck sits the conductor, who goads the animal into the thickest ranks, and encourages it to increase the devastation: wherever it goes, nothing can withstand its fury; it levels the ranks with its immense bulk, flings such as oppose it into the air, or crushes them to death under its feet. In the mean time, those who are placed upon its back combat as from an eminence, and fling down their weapons with double force, their weight being added to their velocity. Nothing therefore, can be more dreadful, or more irresistible, than such a moving machine, to men unacquainted with the modern arts of war, the elephant, thus armed and conducted, raging in the midst of the field of battle, inspires more terror than even those machines that destroy at a distance, and are often most fatal, when most unseen. But this method of combating, is rather formidable than effectual: polished nations have ever been victorious over those semi-barbarous troops that have called in the elephant to their assistance, or attempt to gain a victory by merely astonishing their opposers. The Romans quickly learned the art of opening their ranks to admit the elephant, and thus separating it from assistance, quickly compelled its conductors to calm the animal's fury, and to submit. It sometimes also happened that the elephant became impatient of control; and, instead of obeying its conductor, turned upon those forces it was employed to assist. In either case, there was a great deal of preparation to very little effect, for a single elephant is known to consume as much as forty men in a day.

At present, therefore, they are chiefly employed in carrying, or drawing burdens, throughout the whole Peninsula of India; and no animal can be more fitted by Nature for this employment. The strength of an elephant is equal to its bulk; for it can with great ease draw a load that six horses could not remove; it can readily carry upon its back three or four thousand weight; upon its tusks alone it can support near a thousand: its force may also be estimated from the velocity of its motion, compared to the mass of its body. It can go, in its ordinary pace, as fast as a horse at an easy trot; and, when pushed, it can move as swiftly as a horse at full gallop. It can travel with ease fifty or sixty miles a day; and, when hard pressed, almost double that distance. It may be heard trotting on at a great distance; it is easy also to follow it by the track, which is deeply impressed on the ground, and from fifteen to eighteen inches in diameter.

In India they are also put to other very disagreeable offices; for in some courts of the more barbarous princes, they are used as executioners; and this horrid task they perform with great dexterity: with their trunks they are seen to break every limb of the criminal at the word of command; they sometimes trample him to death, and sometimes impale him on their enormous tusks, as directed. In this the elephant is rather the servant of a cruel master than a voluntary tyrant, since no other animal of the forest is so naturally benevolent and gentle; equally mindful of benefits as sensible of neglect, he contracts a friendship for his keeper, and obeys him even beyond his capacity.

In India, where they were at one time employed in launching ships, a particular elephant was directed to force a very large vessel into the water: the work proved superior to its strength, but not to its endeavours, which, however, the keeper affected to despise. "Take away," says he, "that lazy beast, and bring another better fitted for service." The poor animal instantly upon this redoubled its efforts, fractured his skull, and died upon the spot.

In Delhi, an elephant, passing along the streets, put his trunk into a tailor's shop, where several people were at work. One of the persons of the shop, desirous of some amusement, pricked the animal's trunk with his needle, and seemed highly delighted with this slight punishment. The elephant, however, passed on without any immediate signs of resentment; but coming to a puddle filled with dirty water, he filled his trunk, returned to the shop, and spurted the contents over all the finery upon which the tailors were then employed.

An elephant in Adsmeer, which often passed through the bazar or market, as he went by a certain herb-woman, always received from her a mouthful of greens. Being one day seized with a periodical fit of madness, he broke his fetters, and running through the market, put the crowd to flight, and among others, this woman, who in her haste, forgot a little child at her stall. The elephant recollecting the spot where his benefactress was accustomed to sit, took up the infant gently in his trunk, and conveyed it to a place of safety.

At the Cape of Good Hope it is customary to hunt those animals for the sake of their teeth. Three horsemen, well mounted, and armed with lances, attack the elephant alternately, each relieving the other, as they see their companion pressed, till the beast is subdued. Three Dutchmen, brothers, who had made large fortunes by this business, determined to retire to Europe, and enjoy the fruits of their labours; but they resolved, one day before they went, to have a last chase, by way of amusement: they met with their game, and commenced their attack in the usual manner: but, unfortunately one of their horses falling, happened to fling his rider, the enraged elephant instantly seized the unhappy huntsman with his trunk, flung him up to a vast height in the air, and received him upon one of his tusks as he fell; and then turning towards the other two brothers, as if it were with an aspect of revenge and insult, held out to them the impaled wretch, writhing in the agonies of death.

The teeth of the elephant are what produces the great enmity between him and mankind; but whether they are shed like the horns of the deer, or whether the animal be killed to obtain them, is not yet perfectly known. All we have as yet certain, is, that the natives of Africa, from whence almost all our ivory comes, assure us, that they find the greatest part of it in their forests; nor would, say they, the teeth of an elephant recompense them for their trouble and danger in killing it: notwithstanding, the elephants which are tamed by man, are never known to shed their tusks; and from the hardness of their substance, they seem no way analogous to deer's horns.

The teeth of the elephant are very often found in a fossil state Some years ago, two great grinding teeth, and part of the tusk of an elephant were discovered at the depth of forty-two yards in a lead mine in Flintshire.*

The tusks of the Mammoth, so often found fossil in Siberia, and which are converted to the purposes of ivory, are generally supposed to belong to the elephant: however, the animal must have been much larger in that country than it is found at present, as those tusks are often known to weigh four hundred pounds; while those that come from Africa seldom exceed two hundred and fifty. These enormous tusks are found lodged in the sandy banks of the Siberian rivers; and the

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* Pennant's Synopsis, p. 90.

Zebu, p. 32.

Rhinoceros, p. 285.

To face p. 285, vol. ii.

natives pretend that they belong to an animal which is four times as large as the elephant.

There have lately been discovered several enormous skeletons, five or six feet beneath the surface, on the banks of the Ohio, not remote from the river Miami, in America, seven hundred miles from the sea-coast. Some of the tusks are near seven feet long; one foot nine inches in circumference at the base, and one foot near the point; the cavity at the root or base, nineteen inches deep. Besides their size, there are yet other differences: the tusks of the true elephant have sometimes a very slight lateral bend; these have a larger twist, or spiral curve, towards the smaller end: but the great and specific difference consists in the shape of the grinding-teeth, which, in these newly found, are fashioned like the teeth of a carnivorous animal; not flat and ribbed transversely on their surface, like those of the modern elephant, but furnished with a double row of high and conic processes, as if intended to masticate, not to grind their food. A third difference is in the thigh-bone, which is of a great disproportionable thickness to that of the elephant; and has also some other anatomical variations. These fossil bones have been also found in Peru and the Brazils; and when cut and polished by the workers in ivory, appear in every respect similar. It is the opinion of Dr. Hunter, that they must have belonged to a larger animal than the elephant; and differing from it in being carnivorous. But as yet this formidable creature has evaded our search; and if, indeed, such an animal exists, it is happy for man that it keeps at a distance; since what ravages might not be expected from a creature endued with more than the strength of the elephant, and all the rapacity of the tiger!

CHAPTER III.

OF THE RHINOCEROS.

NEXT to the elephant, the Rhinoceros is the most powerful of animals. It is usually found twelve feet long, from the tip of the nose to the insertion of the tail; from six to seven feet high; and the circumference of its body is nearly equal to its length. It is, therefore, equal to the elephant in bulk: and if it appears much smaller to the eye, the reason is, that its legs are much shorter. Words can convey but a very confused idea of this animal's shape; and yet there are few so remarkably formed: its head is furnished with a horn, growing from the snout, sometimes three feet and a half long; and but for this, that part would have the appearance of the head of a hog; the upper lip however, is much longer in proportion, ends in a point, is very pliable, serves to collect its food, and deliver it into its mouth: the ears are large, erect, and pointed; the eyes are small and piercing; the skin is naked, rough, knotty, and lying upon the body in folds, after a very peculiar fashion. there are two folds very remarkable; one above the shoulders, and another over the rump: the skin, which is of a dirty brown colour, is so thick and hard as to turn the edge of a scimitar, and even to resist a musket ball: the belly hangs low; the legs are short, strong, and thick, and the hoofs divided into three parts, each pointing forward.

Such is the general outline of an animal that appears chiefly formidable from the horn growing from its snout, and formed rather for war, than with a propensity to engage. This horn is sometimes found from three to three and a half feet long, growing from the solid bone, and so disposed as to be managed to the greatest advantage. It is composed of the most solid substance, and pointed so as to inflict the most fatal wounds. The elephant, the boar, or the buffalo, are obliged to strike transversely with their weapons; but the rhinoceros employs all his force with every blow: so that the tiger will more willingly attack any other animal of the forest, than one whose strength is so justly employed. Indeed, there is no force which this terrible animal has to apprehend: defended on every side by a thick horny hide, which the claws of the lion or the tiger are unable to pierce, and armed before with a weapon that even the elephant does not choose to oppose. The missionaries assure us, that the elephant is often found dead in the forests, pierced with the horn of a rhinoceros; and though it looks like wisdom to doubt whatever they tell us, yet I cannot help giving credit to what they relate on this occasion, particularly when confirmed by Pliny. The combat between these two, the most formidable animals of the forest, must be very dreadful. Emanuel, king of Portugal, willing to try their strength, actually opposed them to each other, and the elephant was defeated.

But though the rhinoceros is thus formidable by nature, yet imagination has not failed to exert itself, in adding to its terrors. The scent is said to be most exquisite; and it is affirmed that it consorts with the tiger. It is reported also, that when it has overturned a man, or any other animal, it continues to lick the flesh quite from the bone with its tongue, which is said to be extremely rough. All this, however, is fabulous: the scent, if we may judge from the expansion of the olfactory nerves, is not greater than that of a hog, which we know to be indifferent; it keeps company with the tiger only because they both frequent watery places in the burning climates where they are bred; and as to its rough tongue, that is so far from the truth, that no animal of near its size has so soft a one. "I have often felt it myself," says Ladvocat, in his description of this animal; "it is smooth, soft, and small, like that of a dog; and to the feel, it appears as if one passed the hand over velvet. I have often seen it lick a young man's face who kept it, and both seemed pleased with the action."

The rhinoceros which was shown at London in 1739, and described by Doctor Parsons, had been sent from Bengal. Though it was very young, not being above two years old, yet the charge of his carriage and food from India, cost near a thousand pounds. It was fed with rice, sugar, and hay: it was daily supplied with seven pounds of rice, mixed with three of sugar, divided into three portions; it was given great quantities of hay and grass, which it chiefly preferred; its drink was water which it took in great quantities. It was of a gentle disposition, and permitted itself to be touched and handled by all visitors, never attempting mischief, except when abused, or when hungry; in such a case there was no method of appeasing its fury but by giving it something to eat. When angry, it would jump up against the walls of its room with great violence, and make many efforts to escape, but seldom attempted to attack its keeper, and was always submissive to his threats. It had a peculiar cry, somewhat a mixture between the grunting of a hog, and the bellowing of a calf.

The age of these animals is not well known; it is said by some, that they bring forth at three years old, and if we may reason from analogy, it is probable they seldom live till above twenty. That which was shown in London, was said by its keeper to be eighteen years old, and even at that age, he pretended to consider it as a young one; however, it died shortly after, and that probably in the course of nature.

The rhinoceros is a native of the deserts of Asia and Africa, and is usually found in those extensive forests that are frequented by the elephant and the lion. As it subsists entirely upon vegetable food, it is peaceful and harmless among its fellows of the brute creation; but, though it never provokes to combat, it equally disdains to fly. It is every way fitted for war, but rests content in the consciousness of its security. It is particularly fond of the prickly branches of trees, and is seen to feed upon such thorny shrubs as would be dangerous to other animals, either to gather or to swallow. The prickly points of these, however, may only serve to give a poignant relish to this animal's palate, and may answer the same grateful ends in seasoning its banquet, that spices do in heightening ours.

In some parts of the kingdom of Asia, where the natives are more desirous of appearing warlike than showing themselves brave, these animals are tamed, and led into the field to strike terror into the enemy; but they are always an unmanageable and restive animal, and probably more dangerous to the employers than those whom they are brought to oppose.

The method of taking them is chiefly by watching them, till they are found either in some moist or marshy place, where, like hogs, they are fond of sleeping and wallowing. They then destroy the old one with fire arms; for no weapons that are thrown by the force of man are capable of entering this animal's hide. If, when the old one is destroyed, there happens to be a cub, they seize and tame it. These animals are sometimes taken in pit-falls, covered with green branches, laid in those paths which the rhinoceros makes in going from the forest to the river side.

There are some varieties in this animal, as in most others, some of them are found in Africa with a double horn, one growing above the other. This weapon, if considered in itself, is one of the strongest and most dangerous that Nature furnishes to any part of the animal creation. The horn is entirely solid, formed of the hardest bony substance, growing from the upper maxillary bone, but by so strong an apophyse, as seemingly to make but one part with it. Many are the medicinal virtues that are ascribed to this horn, when taken in powder; but these qualities have been attributed to it without any real foundation, and make only a small part of the many fables which this extraordinary animal has given rise to.

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CHAPTER IV.

THE HIPPOPOTAMOS.

THE Hippopotamos is an animal as large, and not less formidable than the rhinoceros; its legs are shorter, and its head rather more bulky than that of the animal last described. We have had but few opportunities in Europe of examining this formidable creature minutely; its dimensions, however, have been pretty well ascertained by a description given us by Zerenghi, an Italian surgeon, who procured one of them to be killed on the banks of the river Nile. By his account it appears that this terrible animal, which chiefly resides in the waters of that river, is above seventeen feet long, from the extremity of the snout to the insertion of the tail; above sixteen feet in circumference round the body, and above seven feet high: the head is near four feet long, and above nine in circumference. The jaws open about two feet wide, and the cutting-teeth, of which it hath four in each jaw, are above a foot long.

Its feet in some measure resemble those of the elephant, and are divided into four parts. The tail is short, flat, and pointed; the hide is amazingly thick, and though not capable of turning a musket ball, is impenetrable to the blow of a sabre; the body is covered over with a few scattered hairs of a whitish colour. The whole figure of the animal is something between that of an ox and a hog, and its cry is something between the bellowing of the one, and the grunting of the other.

This animal, however, though so terribly furnished for war, seems no way disposed to make use of its prodigious strength against an equal enemy; it chiefly resides at the bottom of the great rivers and lakes of Africa; the Nile, the Niger, and the Zara; there it leads an indolent kind of life, and seems seldom disposed for action, except when excited by the calls of hunger. Upon such occasions, three or four of them are often seen at the bottom of a river, near some cataract, forming a kind of line, and seizing upon such fish as are forced down by the violence of the stream. In that element they pursue their prey with great swiftness and perseverance; they swim with much force, and remain at the bottom for thirty or forty minutes without rising to take breath. They traverse the bottom of the stream, as if walking upon land, and make a terrible devastation where they find a great plenty of prey. But it often happens that this animal's fishy food is not supplied in sufficient abundance; it is then forced to come upon land, where it is an awkward and unwieldy stranger; it moves but slowly, and, as it seldom forsakes the margin of the river, it sinks at every step it takes sometimes, however, it is forced by famine up into the higher grounds where it commits dreadful havoc among the plantations of the helpless natives, who see their possessions destroyed without daring to resist their invader. Their chief method is by lighting fires, striking drums, and raising a cry to frighten it back to its favourite element; and as it is extremely timorous upon land, they generally succeed in their endeavours. But if they happen to wound, or otherwise irritate it too closely, it then becomes formidable to all that oppose it: it overturns whatever it meets, and brings forth all its strength, which it seemed not to have discovered before that dangerous occasion. It possesses the same inoffensive disposition in its favourite element that it is found to have upon land: it is never found to attack the mariners in their boats as they go up and down the stream; but should they inadvertently strike against it, or otherwise disturb its repose, there is much danger of sending them at once to the bottom. "I have seen," says a mariner, as we find it in Dampier, "one of these animals open its jaws, and seizing any boat between his teeth, at once bite and sink it to the bottom. I have seen it, upon another occasion, place itself under one of our boats, and rising under it, overset it with six men who were in it, who, however happily received no other injury." Such is the great strength of this animal; and from hence, probably, the imagination has been willing to match it in combat against others more fierce, and equally formidable. The crocodile and shark have been said to engage with it, and yield an easy victory; but as the shark is only found at sea, and the hippopotamos never ventures beyond the mouth of fresh-water rivers, it is most probable that these engagements never occurred; it sometimes happens, indeed, that the princes of Africa amuse themselves with combats, on their fresh water lakes, between this and other formidable animals; but whether the rhinoceros or the crocodile are of this number, we have not been particularly informed. If this animal be attacked on land, and find itself incapable of vengeance from the swiftness of its enemy, it immediately returns to the river, where it plunges in head foremost, and after a short time rises to the surface, loudly bellowing, either to invite or intimidate the enemy; but though the Negroes will venture to attack the shark or the crocodile in their natural element, and there destroy them, they are too well apprised of the force of the hippopotamos to engage it: this animal, therefore, continues the uncontrolled master of the river, and all others fly from its approach, and become an easy prey.

As the hippopotamos lives upon fish and vegetables, so it is probable the flesh of terrestrial animals may be equally grateful: the natives of Africa assert, that it has often been found to devour children and other creatures that it was able to surprise upon land; yet as it moves but slowly, almost every creature endued with a common share of swiftness, is able to escape it; and this animal, therefore, seldom ventures from the river side, except when pressed by the necessities of hunger, or of bringing forth its young.

The female always comes upon land to bring forth, and it is supposed that she seldom produces above one at a time. Upon this occasion these animals are particularly timorous, and dread the approach of a terrestrial enemy. The instant the parent hears the slightest noise it dashes into the stream, and the young one is seen to follow it with equal alacrity.

The young ones are said to be excellent eating; but the Negroes to whom nothing that has life comes amiss, find an equal delicacy in the old. Dr. Pococke has seen their flesh sold in the shambles, like beef; and it is said that their breast, in particular, is as delicate eating as veal. As for the rest, these animals are found in great numbers, and as they produce very fast, their flesh might supply the countries where they are found, could those barbarous regions produce more expert huntsmen. It may be remarked, however, that this creature, which was once in such plenty at the mouth of the Nile, is now wholly unknown in Lower Egypt, and is no where to be found in that river, except above the cataracts.

CHAPTER V.

THE CAMELOPARD.

WERE we to be told of an animal so tall, that a man on horseback could with ease ride under its belly without stooping, we should hardly give credit to the relation; yet of this extraordinary size is the Camelopard, an animal that inhabits the deserts of Africa, and the accounts of which are so well ascertained, that we cannot deny our assent to their authority. It is no easy matter to form an adequate idea of this creature's size, and the oddity of its formation. It exhibits somewhat the slender shape of the deer, or the camel, but destitute of their symmetry, or their easy power of motion. The head somewhat resembles that of the deer, with two round horns, near a foot long, and, which, it is probable, it sheds as deer are found to do; its neck resembles that of a horse; its legs and feet those of the deer; but with this extraordinary difference, that the fore-legs are near twice as long as the hinder. As these creatures have been found eighteen feet high, and ten from the ground to the top of the shoulder, so allowing three feet for the depth of the body, seven feet remains, which is high enough to admit a man mounted upon a middle-sized horse. The hinder part, however, is much lower, so that when the animal appears standing, and at rest, it has somewhat the appearance of a dog sitting; and this formation of its legs gives it an awkward and a laborious motion, which, though swift, must yet be tiresome. For this reason the camelopard is an animal very rarely found, and only finds refuge in the most internal desert regions of Africa. The dimensions of a young one, as they were accurately taken by a person who examined its skin, that was brought from the Cape of Good Hope, were found to be as follows: the length of the head was one foot eight inches; the height of the fore-leg, from the ground to the top of the shoulder, was ten feet; from the shoulder to the top of the head, was seven; the height of the hind-leg was eight feet five inches; and from the top of the shoulder to the insertion of the tail was just seven feet long.

No animal, either from its disposition, or its formation, seems less fitted for a state of hostility; its horns are blunt, and even knobbed at the ends; its teeth are made entirely for vegetable pasture; its skin is beautifully speckled with white spots upon a brownish ground; it is timorous and harmless; and notwithstanding its great size, rather flies from, than resists the slightest enemy. It partakes very much of the nature of the camel, which it so nearly resembles. It lives entirely upon vegetables, and when grazing, is obliged to spread its fore-legs very wide in order to reach its pasture. Its motion is a kind of pace, two legs on each side moving at the same time, whereas in other animals they move transversely. It often lies down with its belly to the earth, and, like the camel, has a callous substance upon its breast, which, when reposed, defends it from injury. This animal was known to the ancients, but has been very rarely seen in Europe. One of them was sent from the East to the emperor of Germany, in the year 1559; but they have often been seen tame at Grand Cairo, in Egypt; and, I am told, there are two there at present. When ancient Rome was in its splendour, Pompey exhibited at one time no less than ten upon the theatre. It was the barbarous pleasure of the people, at that time, to see the most terrible, and the most extraordinary animals produced in combat against each other. The lion, the lynx, the tiger, the elephant, the hippopotamos, were all let loose promiscuously, and were seen to inflict indiscriminate destruction.

END OF THE SECOND VOLUME

A

HISTORY

OF

THE EARTH

AND

ANIMATED NATURE.

BY

OLIVER GOLDSMITH, M. B.

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WITH CORRECTIONS AND ALTERATIONS.

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CONTENTS.

VOL. III.

Page.

BOOK VII. CONTINUED.

CHAP. VI. The Camel and the Dromedary 5
CHAP. VII. The Lama .. 9
CHAP. VIII. The Nyl-ghau 11
CHAP. IX. The Bear.... 12
CHAP. X. The Badger ... 15
CHAP. XI. The Tapir ... 16
CHAP. XII. The Racoon .. 17
CHAP. XIII. The Coatimondi 18
CHAP. XIV. The Ant-Bear 19
CHAP. XV. The Sloth ... 21
CHAP. XVI. The Gerbua . 23

PART III.—BIRDS.

BOOK I.

OF BIRDS IN GENERAL.

CHAP. I. Introduction ... 27
CHAP. II. The generation, nestling, and incubation of Birds 35
CHAP. III. The division of Birds..... 42
CHAP. IV. The Ostrich .. 45
CHAP. V. The Emu 51
CHAP. VI. The Cassowary. 52
CHAP. VII. The Dodo... 55

BOOK II.

RAPACIOUS BIRDS.

CHAP. I. Rapacious Birds . 57
CHAP. II. The Eagle.... 60
CHAP. III. The Condor of America ... 64
CHAP. IV. The Vulture, &c. 67
CHAP V. The Falcon Kind 71
CHAP. VI. The Butcher-Bird .. 78
CHAP. VII. Rapacious Birds of the Owl Kind 78

BOOK III.

BIRDS OF THE POULTRY KIND.

CHAP. I. Birds of the Poultry Kind..... 84
CHAP. II. The Cock 86
CHAP. III. The Peacock .. 90
CHAP. IV. The Turkey .. 93
CHAP. V. The Pheasant .. 95
CHAP. VI. The Pintada, or Guinea Hen .. 98
CHAP. VII. The Bustard. . 99
CHAP. VIII. The Grouse . 101
CHAP. IX. The Partridge . 103
CHAP. X. The Quail ... 105

BOOK IV.

BIRDS OF THE PIE KIND.

CHAP. I. Birds of the Pie Kind...... 107
CHAP. II. The Raven and the Crow .. 109
CHAP. III. The Magpie .. 114
CHAP. IV. The Woodpecker 118
CHAP. V. The Bird of Paradise 121
CHAP. VI. The Cuckoo .. 123
CHAP. VII. The Parrot . 126
CHAP. VIII. The Pigeon . 13

BOOK V.

BIRDS OF THE SPARROW KIND.

CHAP. I. Birds of the Sparrow Kind ... 36
CHAP. II. The Thrush, &c. 144
CHAP. III, The Nightingale, &c. ... 146

Page.
CHAP. IV The Canary Bird, &c. . . 151
CHAP. V. The Swallow . . 153
CHAP VI. The Humming-Bird 155

BOOK VI

BIRDS OF THE CRANE KIND.

CHAP I. Birds of the Crane Kind in general. 160
CHAP. II. The Crane . . . 162
CHAP. III. The Stork . . . 166
CHAP. IV. The Balearic and other Foreign Cranes 168
CHAP. V. The Heron, &c. 170
CHAP. VI. The Bittern. . . 174
CHAP. VII. The Spoonbill . 175
CHAP. VIII. The Flamingo 177
CHAP. IX. The Avosetta and the Corrira 181
CHAP. X. Small Birds of the Crane Kind . . 182
CHAP. XI. The Water-Hen and the Coot 187

BOOK VII.

WATER-FOWL.

CHAP. I. Water-Fowl in general 190
CHAP. II. The Pelican . . 192
CHAP. III. The Albatross . 195
CHAP. IV. The Cormorant 197
CHAP. V. The Gannet . . . 199
CHAP. VI. Smaller Gulls and Petrels . 201
CHAP. VII. The Penguin Kind . . . 207
CHAP. VIII. The Auk, Puffin, &c. . . . 210
CHAP. IX. Birds of the Goose Kind . 213
CHAP. X. The Swan 215
CHAP. XI. The Goose, &c. 218
CHAP. XII. The Duck, &c. 220
Page
CHAP. XIII. The King-Fisher 225

PART IV.

BOOK I.

FISHES IN GENERAL.

CHAP. I. Introduction . . . 229
CHAP. II. Cetaceous Fishes in general . . . 241
CHAP. III. The Whale . . . 243
CHAP. IV. The Narwhale . 251
CHAP. V. The Cachalot, &c. 253
CHAP. VI. The Dolphin, the Grampus, and the Porpoise . 256

BOOK II.

CARTILAGINOUS FISHES.

CHAP. I. Cartilaginous Fishes in general . . 258
CHAP. II. Cartilaginous Fishes of the Shark Kind . . . 260
CHAP. III. Cartilaginous Flatfish, &c. 264
CHAP. IV. The Lamprey, &c. 272
CHAP. V. The Sturgeon, &c. 274
CHAP. VI. Anomalous Cartilaginous Fishes 278

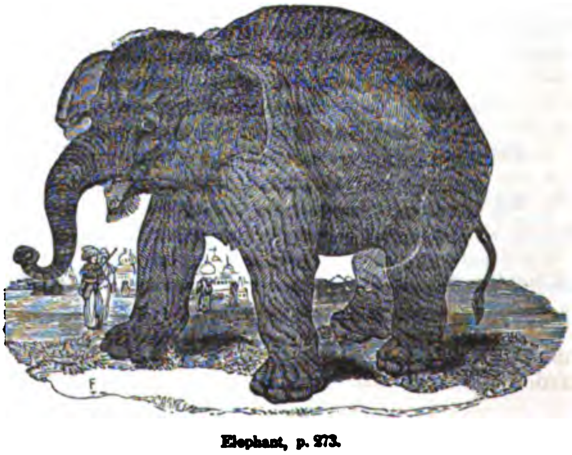
BOOK III.

SPINOUS FISHES.

CHAP. I. The Division of Spinous Fishes 282
Sect. I. Prickly-finned Fishes . . . 284
Sect. II. Soft-finned Fishes
CHAP. II. Spinous Fishes . 289

Camel, p. 6.

Dromedary, p. 6.



Elephant, p. 273.

To face p. 5, vol. iii.

HISTORY OF ANIMALS

BOOK VII.—CONTINUED.

CHAPTER VI.

THE CAMEL AND THE DROMEDARY.[*]

These names do not make two distinct kinds, but are only given to a variety of the same animal, which has, however, subsisted time immemorial. The principal, and perhaps the only sensible difference, by which those two races are distinguished, consists in this, that the camel has two bunches upon his back, whereas the dromedary has but one; the latter, also, is neither so large, nor so strong, as the camel. These two races, however, produce with each other, and the mixed breed formed between them is considered the best, the most patient, and the most indefatigable of all the kind.

Of the two varieties, the dromedary is by far the most numerous, the camel being scarcely ever found, except in Turkey, and the countries of the Levant; while the other is found spread over all the deserts of Arabia, the southern parts of Africa, Persia, Tartary, and a great part of the eastern Indies. Thus the one inhabits an immense tract of country, the other, in comparison, is confined to a province; the one inhabits the sultry countries of the Torrid Zone, the other delights in a warm, but not a burning climate; neither, however, can subsist or propagate in the variable climates towards the north; they seem formed for those countries where shrubs are plenty, and water scarce; where they can travel along the sandy desert without being impeded by rivers, and find food at expected distances; such a country is Arabia, and this, of all others, seems the most adapted to the support and production of this animal.

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[*] These quadrupeds have six front teeth in the lower jaw, which are rather thin and broad; the canine teeth are a little remote from the rest; in the upper jaw there are three, in the lower two: the upper lip divided; and there are no horns.

The camel is the most temperate of all animals, and it can continue to travel several days without drinking. In those vast deserts, where the earth is every where dry and sandy, where there are neither birds nor beasts, neither insects nor vegetables, where nothing is to be seen but hills of sand and heaps of bone, there the camel travels, posting forward, without requiring either drink or pasture, and it often goes six or seven days without any sustenance whatsoever. Its feet are formed for travelling upon sand, and utterly unfit for moist or marshy places; the inhabitants, therefore, find a most useful assistant in this animal, where no other could subsist, and by its means cross those deserts with safety, which would be impassable by any other method of conveyance.

An animal thus formed for a sandy and desert region, cannot be propagated in one of a different nature. Many vain efforts have been tried to propagate the camel in Spain; they have been transported into America, but have multiplied in neither. It is true, indeed, that they may be brought into these countries, and may perhaps be found to produce there; but the care of keeping them is so great, and the accidents to which they are exposed, from the changeableness of the climate, are so many, that they cannot answer the care of keeping. In a few years also they are seen to degenerate; their strength and their patience forsake them; and instead of making the riches, they become the burthen of their keepers.

But it is very different in Arabia, and those countries where the camel is turned to useful purposes. It is there considered as a sacred animal, without whose help the natives could neither subsist, traffic, nor travel; its milk makes a part of their nourishment; they feed upon its flesh, particularly when young; they clothe themselves with its hair, which it is seen to moult regularly once a year; and if they fear an invading enemy, their camels serve them in flight, and in a single day they are known to travel above a hundred miles. Thus, by means of the camel, an Arabian finds safety in his deserts; all the armies upon earth might be lost in the pursuit of a flying squadron of this country, mounted upon their camels, and taking refuge in solitudes where nothing interposes to stop their flight, or to force them to wait the invader. Nothing can be more dreary than the aspect of these sandy plains, that seem entirely forsaken of life and vegetation: wherever the eye turns, nothing is presented but a sterile and dusty soil, sometimes torn up by the winds, and moving in great waves along, which, when viewed from an eminence, resemble less the earth than the ocean; here and there a few shrubs appear, that only teach us to wish for the grove—that reminds us of the shade in these sultry climates, without affording its refreshment: the return of morning, which in other places carries an idea of cheerfulness, here serves only to enlighten the endless and dreary waste, and to present the traveller with an unfinished prospect of his forlorn situation; yet in this chasm of nature, by the help of the camel, the Arabian finds safety and subsistence. There are here and there found spots of verdure, which, though remote from each other, are in a manner approximated by the labour and industry of the camel. Thus these deserts, which present the stranger with nothing but objects of danger and sterility, afford the inhabitant pro tection, food, and liberty. The Arabian lives independent and tranquil in the midst of his solitudes; and, instead of considering the vast solitudes spread round him as a restraint upon his happiness, he is, by experience, taught to regard them as the ramparts of his freedom.

The camel is easily instructed in the methods of taking up and supporting his burden; their legs, a few days after they are produced, are bent under their belly; they are in this manner loaded, and taught to rise; their burden is every day thus increased, by insensible degrees, till the animal is capable of supporting a weight adequate to its force; the same care is taken in making them patient of hunger and thirst: while other animals receive their food at stated times, the camel is restrained for days together, and these intervals of famine are increased in proportion as the animal seems capable of sustaining them. By this method of education, they live five or six days without food or water; and their stomach is formed most admirably by nature to fit them for long abstinence; besides the four stomachs, which all animals have that chew the cud, (and the camel is of the number,) it has a fifth stomach, which serves as a reservoir, to hold a greater quantity of water than the animal has an immediate occasion for. It is of a sufficient capacity to contain a large quantity of water, where the fluid remains without corrupting, or without being adulterated by the other aliments; when the camel finds itself pressed with thirst, it has here an easy resource for quenching it; it throws up a quantity of this water by a simple contraction of the muscles, into the other stomachs, and this serves to macerate its dry and simple food; in this manner, as it drinks but seldom, it takes in a large quantity at a time, and travellers, when straitened for water, have been often known to kill their camels for that which they expected to find within them.

In Turkey, Persia, Arabia, Barbary, and Egypt, their whole commerce is carried on by means of camels; and no carriage is more speedy, and none less expensive in these countries. Merchants and travellers unite themselves into a body, furnished with camels, to secure themselves from the insults of the robbers that infest the countries in which they live. This assemblage is called a *caravan*, in which the numbers are sometimes known to amount to above ten thousand, and the number of camels is often greater than those of the men: each of these animals is loaded according to his strength, and he is so sensible of it himself, that when his burden is too great, he remains still upon his belly, the posture in which he is laden, refusing to rise, till his burden be lessened or taken away. In general, the large camels are capable of carrying a thousand weight, and sometimes twelve hundred; the dromedary, from six to seven. In these trading journeys, they travel but slowly; their stages are generally regulated, and they seldom go above thirty, or at most about five and thirty miles a day. Every evening, when they arrive at a stage, which is usually some spot of verdure, where water and shrubs are in plenty, they are permitted to feed at liberty; they are then seen to eat as much in an hour, as will supply them for twenty-four; they seem to prefer the coarsest weeds to the softest pasture: the thistle, the nettle, the cassia, and other prickly vegetables, are their favourite food; but their drivers take care to supply them with a kind of paste composition, which serves as a more permanent nourishment. As these animals have often gone the same track, they are said to know their way precisely, and to pursue their passage when their guides are utterly astray; when they come within a few miles of their baiting-place, in the evening, they sagaciously scent it at a distance, and increasing their speed, are often seen to trot with vivacity to their stage.

The patience of this animal is most extraordinary; and it is probable, that its sufferings are great, for when it is loaded, it sends forth most lamentable cries, but never offers to resist the tyrant that oppresses it. At the slightest sign, it bends its knees and lies upon its belly, suffering itself to be loaded in this position; by this practice the burden is more easily laid upon it, than if lifted up while standing; at another sign it rises with its load, and the driver getting upon its back, between the two panniers, which, like hampers, are placed upon each side, he encourages the camel to proceed with his voice and with a song. In this manner the creature proceeds contentedly forward, with a slow uneasy walk, of about four miles an hour, and when it comes to its stage, lies down to be unloaded as before.[*]

Mr. Buffon seems to consider the camel to be the most domestic of all other creatures, and to have more marks of the tyranny of man imprinted on its form. He is of opinion, that this animal is not now to be found in a state of nature; that the humps on its back, the callosities upon its breast and its legs, and even the great reservoir for water, are all marks of long servitude and domestic constraint. The deformities he supposes to be perpetuated by generation; and what at first was accident, at last becomes nature. However this be, the humps upon the back grow large in proportion as the animal is well fed, and if examined, they will be found composed of a substance not unlike the udder of a cow.

The inhabitants generally leave but one male to wait on ten females, the rest they castrate; and though they thus become weaker, they are more manageable and patient. The female receives the male in the same position as when these animals are loaded; she goes with young for about a year, and like all other great animals, produces but one at a time. The camel's milk is abundant and nourishing, and mixed with water makes a principal part of the beverage of the Arabians. These animals begin to engender at three years of age, and they ordinarily live from forty to fifty years. The genital part of the male resembles that of the bull, but is placed pointing backwards, so that its urine seems to be ejected in the manner of the female. This, as well as the dung, and almost every part of this animal, is converted to some useful purpose by the keepers. Of the urine, sal ammoniac is made; of the dung, litter for the horses, and fire for the purpose of dressing their victuals. Thus, this animal alone seems to comprise within itself a variety of qualities, any one of which serves to render other quadrupeds absolutely necessary for the welfare of man; like the elephant, it is manageable and tame; like the horse, it gives the rider security; it carries greater burdens than the ox or the mule, and its milk is furnished in as great abundance as that of the cow; the flesh of the young ones is supposed to be as delicate as veal; their hair is more beautiful, and more in request than wool; while even of its very excrements no part is useless.

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[*] Mr. Sonnini says, he has sometimes seen them weary of the impatience of their riders, stop short, turn round their long necks to bite them, and utter cries of rage. In these circumstances the man must be careful not to alight, as he would infallibly be torn to pieces He must also refrain from striking his beast, as that would but increase his fury.

CHAPTER VII.

THE LAMA.

As almost all the quadrupeds of America are smaller than the resembling ones of the ancient continent, so the Lama, which may be considered as the camel of the new world, is every way less than that of the old. This animal, like that described in the former chapter, stands high upon its legs, has a long neck, a small head, and resembles the camel, not only in its natural mildness, but its aptitude for servitude, its moderation and its patience. The Americans early found out its useful qualities, and availed themselves of its labours: like the camel, it serves to carry goods over places inaccessible to other beasts of burden; like that, it is obedient to its driver; and often dies under, but never resists his cruelty.

Of these animals, some are white, others black, but they are mostly brown; its face resembles that of the camel, and its height is about equal to that of an ass. They are not found in the ancient continent, but entirely belong to the new; nor are they found spread over all America, but are found chiefly upon those mountains that stretch from New Spain to the Straits of Magellan. They inhabit the highest regions of the globe, and seem to require purer air than animals of a lower situation are found to enjoy. Peru seems to be the place where they are found in greatest plenty. In Mexico they are introduced rather as curiosities than beasts of burden; but in Potosi, and other provinces of Peru, they make the chief riches of the Indians and Spaniards who rear them: their flesh is excellent food; the hair, or rather wool, may be spun into beautiful clothing; and they are capable, in the most rugged and dangerous ways, of carrying burdens, not exceeding a hundred weight, with the greatest safety. It is true, indeed, that they go but slowly, and seldom above fifteen miles a day; their tread is heavy, but sure; they descend precipices, and find footing among the most craggy rocks, where even men can scarcely accompany them; they are, however, but feeble animals, and after four or five days' labour they are obliged to repose for a day or two. They are chiefly used in carrying the riches of the mines of Potosi; and we are told that there are above three hundred thousand of these animals in actual employ.

This animal, as was said before, is above three feet high, and the neck is three feet long; the head is small and well proportioned; the eyes large, the nose long, the lips thick, the upper divided, and the lower a little depending; like all those animals that feed upon grass, it wants the upper cutting teeth; the ears are four inches long, and move with great agility; the tail is but five inches long, it is small, straight, and a little turned up at the end; it is cloven-footed like the ox, but it has a kind of spear-like appendage behind, which assists it in moving over precipices and rugged ways; the wool on the back is short, but long on the sides and the belly; it resembles the camel in the formation of the genital parts in the male, so that it makes urine backwards: it couples also in the same manner, and though it finds much difficulty in the action, it is said to be much inclined to venery. A whole day is often passed before the necessary business can be completed, which is spent in growling, quarrelling, and spitting at each other; they seldom produce above one at a time, and their age never extends above ten or twelve years at farthest.

Though the lama is no way comparable to the camel, either for size, strength, or perseverance, yet the Americans find a substitute in it, with which they seem perfectly contented. It appears formed for that indolent race of masters which it is obliged to serve; it requires no care, nor no expense in the attending or providing for its sustenance; it is supplied with a warm covering, and therefore does not require to be housed; satisfied with vegetables and grass, it wants neither corn nor hay to subsist it; it is not less moderate in what it drinks, and exceeds even the camel in temperance. Indeed, of all other creatures, it seems to require water least, as it is supplied by nature with saliva in such large quantities, that it spits it out on every occasion: this saliva seems to be the only offensive weapon that the harmless creature has to testify its resentment. When overloaded or fatigued, and driven on by all the torturing acts of its keeper, it falls on its belly, and pours out against him a quantity of this fluid; which, though probably no way hurtful, the Indians are much afraid of. They say, that wherever it falls, it is of such an acrimonious nature, that it will either burn the skin, or cause very dangerous eruptions.

Such are these animals in their domestic state; but as they are found wild in very great numbers, they exhibit marks of great force and agility in their state of nature. The stag is scarcely more swift, or the goat or the chamois a better climber. All its shapes are more delicate and strong; its colour is tawny, and its wool is but short; in their native forests, they are gregarious animals, and are often seen in flocks of two or three hundred at a time. When they perceive a stranger, they regard him at first with astonishment, without marking any fear or surprise; but shortly, as if by common consent, they snuff up the air, somewhat like horses, and at once, by a common flight, take refuge on the tops of the mountains; they are fonder of the northern than the southern side of the Andes; they often climb above the snowy tracts of the mountain, and seem vigorous in proportion to the coldness of their situation. The natives hunt the wild lama for the sake of its fleece. If the dogs surprise one upon the plain, they are generally successful; but if once the lama obtains the rocky precipice of the mountain, the hunters are obliged to desist in their pursuit.

The lama seems to be the largest of the camel kind in America; there are others, which are called GUANACOES and PACOES, that are smaller and weaker, but endued with the same nature, and formed pretty much in the same manner. They seem to bear the same proportions to each other, that the horse does to the ass, and are employed with the same degree of subordination. The wool, however, of the paco, seems to be the most valuable, and it is formed into stuffs not inferior to silk, either in price or beauty. The natural colour of the paco, is that of a dried rose leaf; the manufacturers seldom give its wool any other dye, but form it into quilts and carpets, which exceed those from the Levant. This manufacture forms a very considerable branch of commerce in South America, and probably, too, might be extended to Europe, were the beauty and the durability of what is thus wrought up sufficiently known.

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CHAPTER VIII

THE NYL-GHAU.*

THIS animal, the name of which is pronounced *nylgaw*, is a native of India, and has but lately been imported into Europe; it seems to be of a middle nature, between the cow and the deer, and carries the appearance of both in its form. In its size it is as much smaller than the one, as it is larger than the other; its body, horns, and tail, are not unlike those of a bull; and the head, neck, and legs, are very like those of a deer. The colour, in general, is ash or gray, from a mixture of black hairs and white; all along the ridge or edge of the neck, the hair is blacker, larger, and more erect, making a short, thin, and upright mane. Its horns are seven inches long; they are six inches round at the root; growing smaller by degrees, they terminate in a blunt point. The bluntness of these, together with the form of its head and neck, might incline us to suppose it was of the deer kind: but, as it never sheds its horns, it has a greater affinity to the cow.

From the disposition of that brought over to this country, which has been very accurately and minutely described by Dr. Hunter, their manners were harmless and gentle. Although in its native wildness it is said to be fierce and vicious, this seemed pleased with every kind of familiarity, and always licked the hand that stroked or gave it bread, and never once attempted to use its horns offensively; it seemed to have much dependence on its organs of smell, and snuffed keenly, and with noise, whenever any person came within sight; it did so likewise, when any food or drink was brought to it; and was so easily offended with smells, or so cautious, that it would not taste the bread which was offered, when the hand happened to smell strong of turpentine. Its manner of fighting is very particular. It was observed at Lord Clive's, where two males were put into a little inclosure, that, while they were at a considerable distance from each other, they prepared for the attack, by falling upon their fore-knees, then they shuffled toward each other with a quick pace, keeping still upon their fore-knees; and when they were come within some yards, they made a spring, and darted against each other. The intrepidity and force with which they dart against any object, appeared by the strength with which one of them attempted to overturn a poor labourer, who unthinkingly stood on the outside of the pales of its inclosure. The nyl-ghau, with the quickness of lightning, darted against the wood-work with such violence, that he broke it to pieces, and broke off one of his horns close to the root, which occasioned the animal's death. At all the places in India, where we have settlements, they are considered as rarities, and brought from the distant interior parts of the country. The Emperor sometimes kills them in such numbers, as to distribute quarters of them to all his omrahs, which shows that they are internally wild and in plenty, and esteemed good and delicious food. The nyl-ghaus, which have been brought to England, have been most, if not all of them, received from Surat or Bombay, and they seem to be less uncommon in that part of India, than in Bengal, which gives room for a conjecture that they may be indigenous perhaps in the province of Guzarat, one of the most western and most considerable of the Hindostan empire, lying to the northward of Surat, and stretching away to the Indian ocean.

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* This quadruped is a species of the antelope; the horns are inclining to a triangular form, and the feet are barred with black and white.

CHAPTER IX.

THE BEAR.[*]

Of the Bear there are three kinds, the Brown Bear of the Alps, the Black Bear of North America, which is smaller, and the great Greenland or White Bear. These, though different in their forms, are no doubt of the same original, and owe their chief variations to food and climate. They have all the same habitudes, being equally carnivorous, treacherous, and cruel. It has been said, indeed, that

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[*] The animals of this kind, including the Racoon, Wolverene, Glutton, and Badger, have six front teeth in each jaw; the two lateral ones of the lower jaw are longer than the rest, and lobed, and are likewise furnished with smaller or secondary teeth at their internal bases: the canine teeth are single; there are five or six grinders on each side; the first of which is placed close to the canine teeth; the tongue is smooth, the snout projecting; and the eyes furnished with a nictitant or winking membrane. The soles of the feet are long, and extended to the heel; some use their fore paws as hands, and they are all able to climb trees in search of prey, or to avoid an enemy

Black Bear, p. 12.

Brown Bear, p. 12.

White, or Polar Bear, p. 12.

To face p. 12 vol. iii.

the black bear of America rejects animal food; but of the contrary I am certain, as I have often seen the young ones, which are brought over to London, prefer flesh to every kind of vegetable aliment.

The BROWN BEAR is properly an inhabitant of the temperate climates; the black finds subsistence in the northern regions of Europe and America; while the great white bear takes refuge in the most icy climates, and lives where scarcely any other animal can find subsistence.

The brown bear* is not only savage but solitary; he takes refuge in the most unfrequented parts, and the most dangerous precipices of uninhabited mountains. It chooses its den in the most gloomy parts of the forest, in some cavern that has been hollowed by time, or in the hollow of some old enormous tree. There it retires alone, and passes some months of the winter without provisions, or without ever stirring abroad. However, this animal is not entirely deprived of sensation, like the bat or the dormouse, but seems rather to subsist upon the exuberance of its former flesh, and only feels the calls of appetite, when the fat it had acquired in summer begins to be entirely wasted away. In this manner, when the bear retires to its den, to hide for the winter, it is extremely fat; but at the end of forty or fifty days, when it comes forth to seek for fresh nourishment, it seems to have slept all its flesh away. It is a common report, that during this time they live by sucking their paws, which is a vulgar error that scarcely requires confutation. These solitary animals couple in autumn, but the time of gestation with the female is still unknown; the female takes great care to provide a proper retreat for her young; she secures them in the hollow of a rock, and provides a bed of hay in the warmest part of her den; she brings forth in winter, and the young ones begin to follow her in spring. The male and female by no means inhabit the same den; they have each their separate retreat, and seldom are seen together but upon the accesses of genial desire.

The voice of the bear is a kind of growl, interrupted with rage, which is often capriciously exerted; and though this animal seems gentle and placid to its master, when tamed, yet it is still to be distrusted and managed with caution, as it is often treacherous and resentful without a cause.

This animal is capable of some degree of instruction. There are few but have seen it dance in awkward measures upon its hind feet, to the voice or the instrument of its leader; and it must be confessed that the dancer is often found to be the best performer of the two. I am told, that it is first taught to perform in this manner, by setting it upon hot plates of iron, and then playing to it, while in this uneasy situation.

The bear, when come to maturity, can never be tamed; it then continues in its native fierceness, and, though caged, still formidably impotent, at the approach of its keeper, flies to meet him. But notwithstanding the fierceness of this animal, the natives, in those countries where it is found, hunt it with great perseverance and alacrity

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* Buffon.

The least dangerous method of taking it is by intoxicating it, by throwing brandy upon honey, which it seems to be chiefly fond of, and seeks for in the hollow of trees. In Canada, where the Black Bears are very common, and where their dens are made in the trees that are hollow towards the top, they are taken by setting fire to their retreats, which are often above thirty feet from the ground. The old one is generally seen first to issue from her den, and is shot by the hunters. The young ones, as they descend, are caught in a noose, and are either kept or killed for provision. Their paws are said to be a great delicacy, and their hams are well enough known at the tables of the luxurious here. Their fat also, which still preserves a certain degree of fluidity, is supposed to be an efficacious remedy in white or indolent tumours, though probably very little superior to hog's lard.

The white Greenland Bear differs greatly, both in figure and dimensions, from those already described; and though it preserves in general the external form of its more southern kindred, yet it grows to above three times the size. The brown bear is seldom above six feet long; the white bear is often known from twelve to thirteen. The brown bear is made rather stronger and sturdy, like the mastiff; the Greenland bear, though covered with very long hair, and apparently bulky, is nevertheless more slender, both as to the head, neck, and body, and more inclining to the shape of the greyhound. In short, all the variations of its figure and its colour, seem to proceed from the coldness of the climate where it resides, and the nature of the food it is supplied with.

The white bear seems the only animal that, by being placed in the coldest climate, grows larger than those that live in the temperate zones. All other species of animated nature diminish as they approach the poles, and seem contracted in their size by the rigours of the ambient atmosphere; but the bear, being unmolested in these desolate climates, and meeting no animal but what he can easily conquer, finding also a sufficient supply of fishy provisions, grows to an enormous size; and as the lion is the tyrant of an African forest, so the bear remains undisputed master of the icy mountains in Spitzbergen and Greenland. When our mariners land upon those shores, in such parts as have not been frequented before, the white bears come down to view them with an awkward curiosity; they approach slowly, seeming undetermined whether to advance or retreat, and being naturally a timorous animal, they are only urged on by the conscious experience of their former victories; however, when they are shot at, or wounded, they endeavour to fly, or finding that impracticable, they make a fierce and desperate resistance till they die. As they live upon fish and seals, their flesh is too strong for food, and the captors have nothing but the skin to reward them for the dangers incurred in the engagement.

The number of these animals that are found about the north pole, if we consider the scarcity there of all other terrestrial creatures, is very amazing. They are not only seen at land, but often on ice-floats, several leagues at sea. They are often transported in this manner to the very shores of Iceland, where they no sooner land, but all the natives are in arms to receive them. It often happens, that when a Greenlander and his wife are paddling out at sea, by coming too near an ice-float, a white bear unexpectedly jumps into their boat, and if he does not overset it, sits calmly where he first came down, and, like a passenger, suffers himself to be rowed along. It is probable the poor little Greenlander is not very fond of his new guest; however, he makes a virtue of necessity, and hospitably rows him to shore.

As this animal lives chiefly upon fish, seals, and dead whales, it seldom removes far from the shore. When forced by hunger, it often ventures into the deep, swims after seals, and devours whatever it can seize; it is, however, but a bad swimmer, and is often hunted in this manner by boats till it is fatigued, and at last destroyed. It often happens that a battle ensues between a bear and a morse or a whale, but as the latter are more expert in their own element, they generally prove victorious. However, when the bear can find a young whale, it repays him for the danger he incurs of meeting with the parent.

CHAPTER X.

THE BADGER.

The Badger's legs are so short, that its belly seems to touch the ground; this, however, is but a deceitful appearance, as it is caused by the length of the hair, which is very long all over the body, and makes it seem much more bulky than it really is. It is a solitary, stupid animal, that finds refuge remote from man, and digs itself a deep hole with great assiduity. It seems to avoid the light, and seldom quits its retreat by day, only stealing out at night to find subsistence. It burrows in the ground very easily, its legs being short and strong, and its claws stiff and horny. As it continues to bury itself, it throws the earth behind it, to a great distance, and thus forms to itself a winding hole, at the bottom of which it remains in safety. As the fox is not so expert at digging into the earth, it often takes possession of that which has been quitted by the badger, and some say, forces it from its retreat, by laying its excrements at the mouth of the badger's hole.

This animal, however, is not long in making itself a new habitation, from which it seldom ventures far, as it flies but slowly, and can find safety only in the strength of its retreat. When it is surprised by the dogs at some distance from its hole, it then combats with desperate resolution; it falls upon its back, defends itself on every side, and seldom dies unrevenged in the midst of its enemies.

The badger, like the fox, is a carnivorous animal, and nothing that has life can come amiss to it. It sleeps the greatest part of its time and thus, without being a voracious feeder, it still keeps fat, particularly in winter. They always keep their hole very clean; and when the female brings forth, she makes a comfortable warm bed of hay, at the bottom of her hole, for the reception of her young. She brings forth in summer, generally to the number of three or four, which she feeds at first with her milk, and afterwards with such petty prey as she can surprise. She seizes the young rabbits in their warren, robs birds' nests, finds out where the wild bees have laid up their honey, and brings all to her expecting brood.

The young ones, when taken, are easily tamed, but the old still continue savage and incorrigible; the former, after a short time, play with the dogs, follow their masters about the house, but seem of all other animals the most fond of the fire. They often approach it so closely that they burn themselves in a dangerous manner. They are sometimes also subject to the mange, and have a gland under their tail which scents pretty strongly. The poor of some countries eat their flesh, which, though fat, is at best but rank and ill tasted.

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CHAPTER XI.

THE TAPIR.

There seems to be a rude, but inferior resemblance between many animals of the old and the new world. The cougar of America resembles the tiger in natural ferocity, though far inferior in its dimensions. The lama bears some affinity to the camel, but is far behind it in strength and utility. The tapir may be considered as the hippopotamus of the new continent, but degraded both as to its size and ferocity.

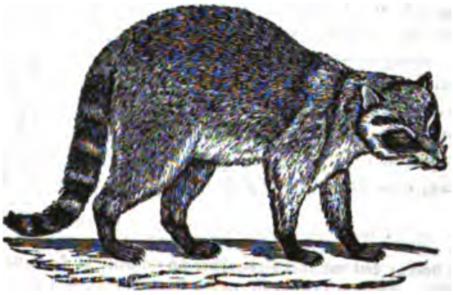
This animal bears some distant resemblance in its form to a mule. It has a long snout, which it lengthens or contracts at pleasure. Its ears are small, long, and pendent. Its neck and tail are short, and its claws strong and firm, of which it has four upon each foot. Its skin is thick, and covered with brown hair; and the natives make shields of it, which cannot be pierced by an arrow.

This animal may, in some measure, be termed amphibious, as it chiefly resides in the water. It differs, however, from all others of this kind, in feeding entirely upon vegetables, and not making this element the place of its depredations. It feeds upon the pastures by the river-side, and as it is very timorous, the instant it hears the least

* The Tapir has ten front teeth in both jaws; the canine teeth are single in each jaw, and are bent inwards; there are five very broad grinders on each side in both jaws: the feet have three hoofs; but on the fore-feet is an additional false or supplementary hoof. Its general attitude, when at rest, is sitting on its rump. It sleeps much by day, and when attacked by dogs, makes a vigorous resistance. Its voice is a kind of whistle, so easily imitated, that in this manner it is frequently trepanned. It produces but one young at a birth, of which it is very careful, leading it early in the water, to instruct it in swimming. It is gregarious, feeds by night on vegetables, and does not ruminate, as Mr. Buffon affirms

Tapir, p. 16.

Kangaroo, p. 24.



Racoon, p. 16.

To face p. 16, vol. iii.

noise, it plunges into the stream. They are greatly sought after by the natives, as their flesh is considered as a delicacy, and thought by some not inferior to beef

CHAPTER XII.

THE RACOON.

The Racoon, which some authors have called the Jamaica rat, is about the size of a small badger; its body is short and bulky; its fur is fine, long, and thick, blackish at the surface, and gray towards the bottom; the nose is rather shorter, and more pointed than that of a fox; the eyes large and yellow, the teeth resembling those of a dog, the tail thick, but tapering towards a point, regularly marked with rings of black, and at least as long as the body; the fore-feet are much shorter than the hinder, both armed with five sharp claws, with which, and its teeth, the animal makes a vigorous resistance. Like the squirrel, it makes use of its paws to hold its food while eating, but it differs from the monkey kind, which use but one hand on those occasions, whereas the racoon and the squirrel use both; as, wanting the thumb, their paws singly are unfit for grasping or holding. Though this animal be short and bulky, it is however very active; its pointed claws enable it to climb trees with great facility; it runs on the trunk with the same swiftness that it moves upon the plain, and sports among the most extreme branches with great agility, security, and ease; it moves forward chiefly by bounding, and though it proceeds in an oblique direction, it has speed enough most frequently to escape its pursuers.

This animal is a native of the southern parts of America, nor have any travellers mentioned its being found in the Ancient Continent. But in the climates of which it is a native, it is found in noxious abundance, particularly in Jamaica, where it keeps in the mountains, and where it often descends to feed upon the plantations of sugar-cane. The planters of these climates consider these animals as one of their greatest miseries; they have contrived various methods of destroying them, yet still they propagate in such numbers that neither traps nor fire-arms can set them free; so that a swarm of these famished creatures are found to do more injury in a single night, than the labours of a month can repair.

But though, when wild, they are thus troublesome, in a state of tameness no animal is more harmless or amusing; they are capable of being instructed in various little amusing tricks. The racoon is playful and cleanly, and is very easily supported; it eats of every thing that is given it, and, if left to itself, no cat can be a better provider; it examines every corner, eats of all flesh, either boiled or raw, eggs, fruits, or corn; insects themselves cannot escape it, and if left at liberty in a garden, it will feed upon snails, worms, and beetles; but it has a particular fondness for sweets of every kind, and to be possessed of these, in its wild state, it incurs every danger. Though it will eat its provisions dry, it will for choice dip them in water, if it happens to be in the way; it has one peculiarity which few other animals have been found to possess, it drinks as well by lapping like the dog as by sucking like the horse.

CHAPTER XIII.

THE COATIMONDI.

The first peculiarity with which this animal strikes the spectator is the extreme length of its snout, which, in some measure, resembles that of the hog, but elongated to a surprising degree; it bears some distant resemblance to the animal last described, except that the neck and the body are longer, the fur shorter, and the eyes smaller; but its principal distinction, as was said before, consists in the shape of its nose; the upper jaw being an inch longer than the lower, and the snout, which is moveable in every division, turning up at the end. Like the racoon, it sits up on the hinder legs with great ease, and in this position, with both paws carries the food to its mouth.

This animal is very subject to eat its own tail, which is rather longer than its body; but this strange appetite is not peculiar to the coati alone; the mococo, and some of the monkey kinds do the same, and seem to feel no pain in wounding a part of the body, so remote from the centre of circulation.

It seems possessed of the same playful qualities, and indiscriminate appetites, with the animal described in the last chapter; if left at liberty in a state of tameness, it will pursue the poultry, and destroy every living thing that it has strength to conquer; though it is playful with its keeper, yet it seems obstinately bent against receiving any instruction, and neither threats nor caresses can induce it to practise any arts to which it is not naturally inclined. When it sleeps it rolls itself up in a lump, and in that position often continues for fourteen or fifteen hours together.

Coatimondi, p. 18.

Sloth, p. 21

To face p. 18, vol. iii.

CHAPTER XIV.

THE ANT-BEAR.

There are many animals that live upon ants in Africa and America; the pangolin or scaly lizard of Guinea may be considered among this number; but there are a greater variety in America, which make those minute insects their only subsistence. Though they are of different figures and sizes, yet, in general, they go under one common name of the ant-bear; the peculiar length and slenderness of their snout, their singular appetites, and their manner of taking their prey, striking us too strongly to attend to the minute differences of their size or form.

They have been classed by Mr. Buffon into the larger tamandua, the smaller tamandua, and the ant-eater. The longest of this kind is four feet long, from the tip of the snout to the insertion of the tail; their legs are short, and armed with four strong claws; their tail is long and tufted, and the animal often throws it on its back like the squirrel. The second of this kind is not above eighteen inches long, the tail is without hair, and it sweeps the ground as the animal moves. The ant-eater, which is the third variety, is still smaller than either of the former, as it is not above seven inches from the tip of the snout to the insertion of the tail. The two former are of a brown dusky colour, but this of a beautiful reddish, mixed with yellow; though they differ in figure, they all resemble each other in one peculiarity, which is the extreme slenderness of their snout, and the amazing length of their tongue.

The snout is produced in so disproportionate a manner, that the length of it makes near a fourth part of the whole figure. A horse has one of the longest heads of any animal we know, and yet the ant bear has one above twice as long in proportion to its body. The snout of this animal is almost round and cylindrical; it is extremely slender, and is scarce thicker near the eyes than at its extremity. The mouth is very small, the nostrils are very close to each other, the eyes are little in proportion to the length of the nose, the neck is short, the tongue is extremely long, slender, and flatted on both sides; this it keeps generally doubled up in the mouth, and is the only instrument by which it finds subsistence; for the whole of this tribe are entirely without teeth, and find safety only in the remoteness and security of their retreat.

If we examine through the various regions of the earth, we shall find that all the most active, sprightly, and useful quadrupeds, have been gathered round man, and either served his pleasures, or still maintained their independence, by their vigilance, their cunning, or their industry. It is in the remote solitudes that we are to look for the helpless, the deformed, and the monstrous births of nature. These wretched animals being incapable of defending themselves, either by their agility, or their natural arms, fall a prey to every creature that attacks them; they therefore retire for safety into the darkest forests, or the most desert mountains, where none of the bolder or swifter animals choose to reside.

It may well be supposed that an animal so helpless as the ant-bear is, with legs too short to fit it for flight, and unprovided with teeth, to give it a power of resistance, is neither numerous, nor often seen; its retreats are in the most barren and uncultivated parts of South America. It is a native only of the new continent, and entirely unknown to the old. It lives chiefly in the woods, and hides itself under the fallen leaves. It seldom ventures from its retreat, and the industry of an hour supplies it with sufficient food for several days together. Its manner of procuring its prey, is one of the most singular in all natural history; as its name implies, it lives entirely upon ants and insects; these, in the countries where it is bred, are found in the greatest abundance, and often build themselves hills, five or six feet high, where they live in community. When this animal approaches an ant-hill, it creeps slowly forward on its belly, taking every precaution to keep itself concealed, till it comes within a proper distance of the place where it intends to make its banquet; there, lying closely along at its length, it thrusts forth its round red tongue, which is often two feet long, across the path of these busy insects, and there lets it lie motionless for several minutes together. The ants of that country, some of which are half an inch long, considering it as a piece of flesh accidentally thrown before them, come forth and swarm upon it in great numbers, but wherever they touch they stick; for this instrument is covered with a slimy fluid, which, like bird-lime, entangles every creature that lights upon it. When, therefore, the ant-bear has found a sufficient number for one morsel, it instantly draws in the tongue, and devours them all in a moment; after which it still continues in its position, practising the same arts until its hunger is entirely appeased; it then retires to its hiding-place once more, where it continues in indolent existence, till again excited by the calls of hunger.

Such is the luxurious life of a creature, that seems of all others the most helpless and deformed. It finds safety in its hiding-places from its enemies, and an ample supply in some neighbouring ant-hill for all its appetites. As it only tries to avoid its pursuers, it is seldom discovered by them; yet helpless as this animal is, when driven to an extremity, though without teeth, it will fight with its claws with great obstinacy. With these arms alone, it has often been found to oppose the dog, and even the jaguar. It throws itself upon its back, fastens upon its enemy with all its claws, sticks with great strength and perseverance, and even after killing its invader, which is sometimes the case, does not quit its hold, but remains fastened upon it with vindictive desperation.

CHAPTER XV.

THE SLOTH.

Of the Sloth there are two different kinds, distinguished from each other by their claws; the one, which in its native country is called the *unan*, having only two claws upon each foot, and being without a tail; the other, which is called the *ai*, having a tail, and three claws upon each foot. The unan has the snout longer, the ears more apparent, and the fur very different from the other. It differs also in the number of its ribs, this having forty-six, while the ai has but twenty-eight. These differences, however, which though very apparent, have been but little regarded in the description of two animals which so strongly resemble each other in the general outlines of their figure, in their appetites, and their helpless formation.

They are both, therefore, described under the common appellation of the sloth, and their habitudes well deserve our wonder and curiosity. Nature seems cramped and constrained in their formation; other animals are often indolent from choice, these are slow from necessity. The ai, from which I shall take my description, and from which the other differs only in the slight particulars above-mentioned, and in being rather more active, is of about the size of a badger. Its fur is coarse and staring, somewhat resembling dried grass; the tail very short, and scarce appearing; the mouth extending from ear to ear; the eye dull and heavy; the feet armed with three claws each, and made so short, and set on so awkwardly, that a few paces is often the journey of a week; but though the feet are short, they are still longer than its legs, and these proceed from the body in such an oblique direction, that the sole of the foot seldom touches the ground. When the animal, therefore, is compelled to make a step forward, it scrapes on the back of the nails along the surface, and wheeling the limbs circularly about, yet still touching the ground, it at length places its foot in a progressive position; the other three limbs are all brought about with the same difficulty; and thus it is seen to move, not above three feet in an hour. In fact, this poor creature seldom changes place but by constraint, and when impelled by the severest stings of hunger.

The sloth seems to be the meanest and most ill-formed of all those animals that chew the cud; it lives entirely upon vegetable food, on the leaves, the fruit, and the flowers of trees, and often even on the very bark, when nothing else is left on the tree for subsistence. Like all other ruminant animals, it has four stomachs; and these requiring a large share of provision to supply them, it generally strips a tree of all its verdure in less than a fortnight. Still, however, it keeps aloft, unwilling to descend, while any thing remains that can serve it for food; it therefore falls to devouring the bark, and thus in a short time kills the tree upon which it found its support. Thus destitute of provisions above, and crawling slowly from branch to branch, in hopes of finding something still left, it is at last obliged to encounter all the dangers that attend it below. Though it is formed by nature for climbing a tree with great pain and difficulty, yet it is unable to descend; it therefore is obliged to drop from the branches to the ground, and as it is incapable of exerting itself to break the violence of its descent, it drops like a shapeless heavy mass, and feels no small shock in the fall. There, after remaining some time torpid, it prepares for a journey to some neighbouring tree; but this of all migrations is the most tedious, dangerous, and painful; it often takes a week in crawling to a tree not fifty yards distant; it moves with imperceptible slowness, and often baits by the way. All motions seem to torture it; every step it takes it sets forth a most plaintive, melancholy cry, which from some distant similitude to the human voice, excites a kind of disgust, mixed with pity. This plaintive sound seems its chief defence, few quadrupeds appear willing to interrupt its progress, either that the flesh is offensive, or that they are terrified at its cries. When at length they reach their destined tree, they mount it with much greater ease than when they moved upon the plain. They fall to with famished appetite, and, as before, destroy the very source that supplies them.

CHAPTER XVI.

THE GERBUA.

This animal as little resembles a quadruped, as that which has been described in a former chapter. If we should suppose a bird devested of its feathers, and walking upon its legs, it might give us some idea of its figure. It has four feet indeed, but in running, or resting, it never makes use of any but the hinder. The number of legs, however, do not much contribute to any animal's speed; and the gerbua, though properly speaking, furnished but with two, is one of the swiftest creatures in the world.

The gerbua is not above the size of a large rat, and its head is sloped somewhat in the manner of a rabbit; the teeth also are formed like those of the rat kind, there being two cutting teeth in each jaw; it has a very long tail, tufted at the end; the head, the back and sides are covered with large ash-coloured soft hair; the breast and belly is whitish; but what most deserves our attention in the formation of this little animal, is the legs; the fore-legs are not an inch long, with four claws and a thumb upon each, while the hinder legs are two inches and a quarter, and exactly resemble those of a bird, there being but three toes, the middlemost of which is longest.

The gerbua is found in Egypt, Barbary, Palestine, and the deserts between Bussorah and Aleppo; its hind-legs, as was said before, are only used in running, while the fore-paws, like those of a squirrel, grasp its food, and in some measure perform the office of hands. It is often seen by travellers as they pass along the deserts, crossing their way, and jumping six or eight feet at every bound, and going so swiftly, that scarce any other quadruped is able to overtake them. They are a lively, harmless race of animals, living entirely upon vegetables, and burrowing like rabbits in the ground. Mr. Pennant tells us of two that were lately brought to London, that burrowed almost through the brick wall of the room where they were kept; they came out of their hole at night for food, and when caught, were much fatter and sleeker than when confined to their burrows. A variety of this animal is found also in Siberia and Circassia, and is, most probably, common enough over all Asia. They are more expert diggers than even the rabbit itself; and when pursued for a long time, if they cannot escape by their swiftness, they try to make a hole instantly in the ground, in which they often bury themselves deep enough to find security before their pursuers come up. Their burrows, in some places, are so thick, as to be dangerous to travellers, the horses perpetually falling in them. It is a provident little animal, and lays up for the winter. It cuts grass in heaps of a foot square, which, when dried, it carries into its burrow, therewith to serve it for food, or to keep its young warm during the rigours of the winter.

But of all animals of this kind, that which was first discovered and described by Mr. Banks, is the most extraordinary. He calls it the *kangaroo;* and though from its general outline, and the most striking peculiarities of its figure, it greatly resembles the gerbua, yet it entirely differs, if we consider its size, or those minute distinctions which direct the makers of systems in assorting the general ranks of nature.

The largest of the gerbua kind which are to be found in the ancient continent, do not exceed the size of a rabbit. The kangaroo of New-Holland, where it is only to be found, is often known to weigh above sixty pounds, and must consequently be as large as a sheep. Although the skin of that which was stuffed and brought home by Mr. Banks, was not much above the size of a hare, yet it was greatly superior to any of the gerbua kind that have been hitherto known, and very different in many particulars. The snout of the gerbua, as has been said, is short and round, that of the discovered animal long and slender; the teeth also entirely differ; for as the gerbua has but two cutting teeth in each jaw, making four in all, this animal, besides its cutting teeth, has four canine teeth also; but what makes a more striking peculiarity is the formation of its lower jaw, which, as the ingenious discoverer supposes, is divided into two parts, which opened and shut like a pair of scissors, and cut grass, probably this animal's principal food. The head, neck, and shoulders are very small in proportion to the other parts of the body; the tail is nearly as long as the body, thick near the rump, and tapering towards the end; the skin is covered with a short fur, excepting the head and ears, which bear a slight resemblance to those of the hare. We are not told, however, from the formation of its stomach, to what class of quadrupeds it belongs; from its eating grass, which it has been seen to do, one would be apt to rank it among the ruminating animals; but from the canine teeth which it is found to have, we may on the other hand suppose it to bear some relation to the carnivorous. Upon the whole, however, it can be classed with none more properly, than with animals of the gerbua kind, as its hind legs are so much longer than the fore; it moves also precisely in the same manner, taking great bounds of ten or twelve feet at a time, and thus sometimes escaping even the fleetest greyhound with which Mr. Banks pursued it. One of them that was killed, proved to be good food; but a second, which weighed eighty-four pounds, and was not yet come to its full growth, was found to be much inferior.

With this last described and last discovered animal, I shall conclude the history of quadrupeds, which of all parts of natural knowledge seems to have been described the most accurately. As these, from their figure, as well as their sagacity, bear the nearest resemblance to man, and from their uses or enmities are the most respectable parts of the inferior creation, so it was his interest, and his pleasure, to make himself acquainted with their history. It is probable, therefore, that time, which enlarges the sphere of our knowledge in other parts of learning, can add but very little to this. The addition of a new quadruped to the catalogue already known, is of no small consequence, and happens but seldom; for the number of all is so few, that wherever a new one is found, it becomes an object worthy our best attention. It may take refuge in its native deserts from our pursuits, but not from our curiosity.

But it is very different with the inferior ranks of the creation; the classes of birds, of fishes, and of insects, are all much more numerous, and more incompletely known. The quadruped is possessed of no arts of escaping, which we are not able to overcome; but the bird removes itself by its swiftness, the fishes find protection in their native element, and insects are secured in their minuteness, numbers, and variety. Of all these, therefore, we have but a very inadequate catalogue; and though the list be already very large, yet every hour is adding to its extent.

In fact, all knowledge is pleasant only as the object of it contributes to render man happy; and the services of quadrupeds being so very necessary to him in every situation, he is particularly interested in their history: without their aid, what a wretched and forlorn creature would he have been! the principal part of his food, his clothing, and his amusements, are derived wholly from them; and he may be considered as a great lord, sometimes cherishing his humble dependents, and sometimes terrifying the refractory, to contribute to his delight and conveniences.

The horse and the ass, the elephant, the camel, the lama, and rein-deer, contribute to ease his fatigues, and to give him that swiftness which he wants from nature. By their assistance, he changes place without labour; he attains health without weariness; his pride is enlarged by the elegance of equipage, and other animals are pursued with a certainty of success. It were happy indeed for man, if, while converting these quadrupeds to his own benefit, he had not turned them to the destruction of his fellow-creatures; he has employed some of them for the purposes of war, and they have conformed to his noxious ambition with but too fatal an obedience.

The cow, the sheep, the deer, and all their varieties, are necessary to him, though in a different manner. Their flesh makes the principal luxuries of his table, and their wool or skins the chief ornament of his person. Even those nations that are forbid to touch any thing that has life, cannot wholly dispense with their assistance. The milk of these animals makes a principal part of the food of every country, and often repairs those constitutions that have been broken by disease or intemperance.

The dog, the cat, and the ferret, may be considered as having deserted from their fellow quadrupeds, to list themselves under the conduct and protection of man. At his command, they exert all their services against such animals as they are capable of destroying, and follow them into places where he himself wants abilities to pursue.

As there is thus a numerous tribe, that he has taken into protection, and that supplies his necessities and amusements, so there is also a still more numerous one, that wages an unequal combat against him, and thus call forth his courage and his industry. Were it not for the lion, the tiger, the panther, the rhinoceros, and the bear, he would scarce know his own powers, and the superiority of human art over brutal fierceness. These serve to excite, and put his noble passions into motion. He attacks them in their retreat, faces them with resolution, and seldom fails of coming off with a victory. He thus becomes hardier and better in the struggle, and learns to know and to value his own superiority.

As the last mentioned animals are called forth by his boldest efforts, so the numerous tribe of the smaller vermin kind excite his continual vigilance and caution; his various arts and powers have been no where more manifest, than in the extirpation of those that multiply with such prodigious fecundity. Neither their agility, nor their minuteness can secure them from his pursuits; and though they may infest, they are seldom found materially to injure him.

In this manner we see, that not only human want is supplied, but that human wit is sharpened, by the humbler partners of man in the creation. By this we see, that not only their benefits, but their depredations are useful, and that it has wisely pleased Providence to place us like victors in a subdued country, where we have all the benefit of conquest, without being so secure as to run into the sloth and excesses of a certain and undisturbed possession. It appears, therefore, that those writers who are continually finding immediate benefit in every production, see but half way into the general system of nature. Experience must every hour inform us, that all animals are not formed for our use; but we may be equally well assured, that those conveniences which we want from their friendship, are well repaid by that vigilance which we procure from their enmity.

PART III.

OF BIRDS.

BOOK III.

OF BIRDS IN GENERAL.

CHAPTER

INTRODUCTION.

We are now come to a beautiful and loquacious race of animals, that embellish our forests, amuse our walks, and exclude solitude from our most shady retirements. From these man has nothing to fear; their pleasures, their desires, and even their animosities, only serve to enliven the general picture of nature, and give harmony to meditation.

No part of nature appears destitute of inhabitants. The woods, the waters, the depths of the earth, have their respective tenants; while the yielding air, and those tracts of seeming space where man never can ascend, are also passed through by multitudes of the most beautiful beings of the creation.

Every order and rank of animals seems fitted for its situation in life; but none more apparently than birds; they share, in common with the stronger race of quadrupeds, the vegetable spoils of the earth; are supplied with swiftness to compensate for their want of force, and have a faculty of ascending into the air to avoid that power which they cannot oppose.

The birds seem formed entirely for a life of escape; and every part of the anatomy of the animal seems calculated for swiftness. As it is designed to rise upon air, all its parts are proportionably light, and expand a large surface without solidity.

In a comparative view with man, their formations seem much ruder and more imperfect; and they are in general found incapable of the docility even of quadrupeds. Indeed, what great degree of sagacity can be expected in animals whose eyes are almost as large as their brain? However, though they fall below quadrupeds in the scale of nature, and are less imitative of human endowments; yet they hold the next rank, and far surpass fishes and insects, both in the structure of their bodies, and in their sagacity.

As in mechanics the most curious instruments are generally the most complicated, so it is in anatomy. The body of man presents the greatest variety upon dissection; quadrupeds, less perfectly formed, discover their defects in the simplicity of their conformation; the mechanism of birds is still less complex; fishes are furnished with fewer organs still; while insects, more imperfect than all, seem to fill up the chasm that separates animal from vegetable nature. Of man, the most perfect animal, there are but three or four species; of quadrupeds, the kinds are more numerous; birds are more various still; fishes yet more; but insects afford so very great a variety, that they elude the search of the most inquisitive pursuer.

Quadrupeds, as was said, have some distant resemblance in their internal structure with man; but that of birds is entirely dissimilar. As they seem chiefly formed to inhabit the empty regions of air, all their parts are adapted to their destined situation. It will be proper, therefore, before I give a general history of birds, to enter into a slight detail of their anatomy and conformation.

As to their external parts, they seem surprisingly adapted for swiftness of motion. The shape of their body is sharp before, to pierce and make way through the air; it then rises by a gentle swelling to its bulk, and falls off in an expansive tail, that helps to keep it buoyant, while the fore-parts are cleaving the air by their sharpness. From this conformation, they have often been compared to a ship making its way through the water; the trunk of the body answers to the hold, the head to the prow, the tail to the rudder, and the wings to the oars; from whence the poets have adopted the metaphor of *remigium alarum*, when they described the wavy motion of a bird in flight.

What we are called upon next to admire, in the external formation of birds, is the neat position of the feathers, lying all one way, answering at once the purposes of warmth, speed, and security. They mostly tend backward, and are laid over one another in an exact and regular order, armed with warm and soft down next the body, and more strongly fortified, and curiously closed externally, to fence off the injuries of the weather. But, lest the feathers should spoil by their violent attrition against the air, or imbibe the moisture of the atmosphere, the animal is furnished with a gland behind, containing a proper quantity of oil, which can be pressed out by the bird's bill, and laid smoothly over every feather that wants to be dressed for the occasion. This gland is situated on the rump, and furnished with an opening or excretory duct; about which grows a small tuft of feathers somewhat like a painter's pencil. When, therefore, the feathers are shattered or rumpled, the bird, turning its head backwards, with the bill catches hold of the gland, and pressing it, forces out the oily substance, with which it anoints the disjointed parts of the feathers; and drawing them out with great assiduity, recomposes and places them in due order; by which they unite more closely together. Such poultry, however, as live for the most part under cover, are not furnished with so large a stock of this fluid, as those birds that reside in the open air. The feathers of a hen, for instance, are pervious to every shower; on the contrary, swans, geese, ducks, and all such as nature has directed to live upon the water, have their feathers dressed with oil from the very first day of their leaving the shell. Thus their stock of fluid is equal to the necessity of its consumption. Their very flesh contracts a flavour from it, which renders it in some so very rancid, as to make it utterly unfit for food; however, though it injures the flesh, it improves the feathers for all the domestic purposes to which they are usually converted.

Nor are the feathers with which birds are covered, less an object of admiration. The shaft of every feather is made proportionably strong; but hollow below for strength and lightness, and above filled with a pith to feed the growth of the vane or beard that springs from the shaft of the feather on either side. All these feathers are placed generally according to their length and strength, so that the largest and strongest feathers in flight have the greatest share of duty. The vane or beard of the feather is formed with equal contrivance and care. It consists not of one continued membrane; because, if this were broken, it could not easily be repaired; but it is composed of many layers, each somewhat in itself resembling a feather, and lying against each other in close conjunction. Towards the shaft of the feather, these layers are broad, and of a semicircular form, to serve for strength, and for the closer grafting them one against another when in action. Towards the outer part of the vane, these layers grow slender, and taper, to be more light. On their underside they are thin and smooth, but their upper outer-edge is parted into two hairy edges, each side having a different sort of hairs, broad at bottom and slender and bearded above. By this mechanism, the hooked beards of one layer always lie next the straight beards of the next, and by that means lock and hold each other.

The next object that comes under consideration in contemplating an animal that flies, is the wing, the instrument by which this wonderful progression is performed. In such birds as fly, they are usually placed at that part of the body which serves to poize the whole, and support it in a fluid that at first seems so much lighter than itself. They answer to the fore-legs in quadrupeds, and at the extremity of this they have a certain finger-like appendix, which is usually called the *bastard-wing*. This instrument of flight is furnished with quills, which differ from the common feathers only in their size, being larger, and also from their springing from the deeper part of the skin, their shafts lying almost close to the bone. The beards of these quills are broad on one side, and more narrow on the other, both which contribute to the progressive motion of the bird, and the closeness of the wing. The manner in which most birds avail themselves of these, is first thus: they quit the earth with a bound, in order to have room for flapping with the wing: when they have room for this, they strike the body of air beneath the wing with a violent motion, and with the whole under surface of the same; but then to avoid striking the air with equal violence on the upper side as they rise, the wing is instantly contracted; so that the animal rises by the impulse, till it spreads the wing for a second blow. For this reason, we always see birds choose to rise against the wind, because they have thus a greater body of air on the under than the upper side of the wing. For these reasons, also, large fowls do not rise easily; both because they have not sufficient room at first for the motion of their wings, and because the body of air does not lie so directly under the wing as they rise.

In order to move the wings, all birds are furnished with two very strong pectoral muscles, which lie on each side of the breast-bone The pectoral muscles of quadrupeds, are trifling in comparison to those of birds. In quadrupeds, as well as in man, the muscles which move the thighs and hinder parts of the body, are by far the strongest, while those of the arms are feeble; but in birds, which make use of their wings, the contrary obtains; the pectoral muscles, that move the wings or arms, are of enormous strength, while those of the thighs are weak and slender. By means of these, a bird can move its wings with a degree of strength which, when compared to the animal's size, is almost incredible. The flap of a swan's wing would break a man's leg; and a similar blow from that of an eagle has been known to lay a man dead in an instant. Such, consequently, is the force of the wing, and such its lightness, as to be inimitable by art. No machines that human skill can contrive, are capable of giving such force to so light an apparatus. The art of flying, therefore, that has so often and so fruitlessly been sought after, must, it is feared, for ever be unattainable; since, as man increases the force of his flying machine, he must be obliged to increase its weight also.

In all birds, except nocturnal ones, the head is smaller, and bears less proportion to the body than in quadrupeds, that it may more readily divide the air in flying, and make way for the body, so as to render its passage more easy. Their eyes also are more flat and depressed than in quadrupeds; a circle of small plates of bones, placed scalewise, under the outer coat of the organ, encompasses the pupil on each, to strengthen and defend it from injuries. Besides this, birds have a kind of skin, called the nictitating membrane, with which, like a veil, they can at pleasure cover their eyes, though their eye-lids continue open. This membrane takes its rise from the greater or more obtuse corner of the eye, and serves to wipe, cleanse, and probably to moisten its surface. The eyes, though they outwardly appear but small, yet separately, each almost equals the brain; whereas in man the brain is more than twenty times larger than the orbit of the eye. Nor is this organ in birds less adapted for vision by a particular expansion of the optic nerve, which renders the impressions of external objects more vivid and distinct.

From this conformation of the eye, it follows, that the sense of seeing in birds is infinitely superior to that of other animals. Indeed this piercing sight seems necessary to the creature's support and safety. Were this organ blunter, from the rapidity of the bird's motion, it would be apt to strike against every object in its way; and it could scarcely find subsistence, unless possessed of a power to discern its food from above with astonishing sagacity. A hawk, for instance, perceives a lark at a distance which neither men nor dogs could spy;

a kite, from an almost imperceptible height in the clouds, darts down on its prey with the most unerring aim. The sight of birds, therefore, exceeds what we know in most other animals, and excels them both in strength and precision.

All birds want the external ear standing out from the head; they are only furnished with holes that convey sounds to the auditory canal. It is true, indeed, that the horned owl, and one or two more birds, seem to have external ears; but what bears that resemblance are only feathers sticking out on each side of the head, but no way necessary to the sense of hearing. It is probable, however, that the feathers encompassing the ear-holes in birds, supply the defect of the exterior ear, and collect sounds to be transmitted to the internal sensory. The extreme delicacy of this organ is easily proved by the readiness with which birds learn tunes, or repeat words, and the great exactness of their pronunciation.

The sense of smelling seems not less vivid in the generality of birds. Many of them *wind* their prey at an immense distance, while others are equally protected by this sense against their insidious pursuers. In decoys, where ducks are caught, the men who attend them universally keep a piece of turf burning near their mouths, upon which they breathe, lest the fowl should smell them, and consequently fly away. The universality of this practice puts the necessity of it beyond a doubt, and proves the extreme delicacy of the sense of smelling, at least in this species of the feathered creation.

Next to the parts for flight, let us view the legs and feet ministering to motion. They are both made light for the easier transportation through the air. The toes in some are webbed, to fit them for the waters; in others, they are separate, for the better holding objects, or clinging to trees for safety. Such as have long legs have also long necks, as otherwise they would be incapable of gathering up their food, either by land or water. But it does not hold, however, that those who have long necks should have long legs, since we see that swans and geese, whose necks are extremely long, have very short legs, and these chiefly employed in swimming.

Thus every external part, hitherto noticed, appears adapted to the life and situation of the animal; nor are the inward parts, though less immediately appropriated to flight, less necessary to safety. The bones of every part of the body are extremely light and thin; and all the muscles, except that immediately moving the wings, extremely slight and feeble. The tail, which is composed of quill feathers, serves to counterbalance the head and neck; it guides the animal's flight, like a rudder, and greatly assists it either in its ascent, or when descending.

If we go on to examine birds internally, we shall find the same wonderful conformation fitting them for a life in air, and increasing the surface by diminishing the solidity. In the first place, their lungs, which are commonly called the *sole*, stick fast to the sides of the ribs and back, and can be very little dilated or contracted. But to make up for this, which might impede their breathing, the ends of the branches of the wind-pipe open into them, while these have openings into the cavity of the belly, and convey the air drawn in by breathing into certain receptacles like bladders, running along the length of the whole body. Nor are these openings obscure, or difficult to be discerned; for a probe, thrust into the lungs of a fowl, will easily find a passage into the belly; and air blown into the wind-pipe will be seen to distend the animal's body like a bladder. In quadrupeds this passage is stopped by the midriff; but in fowls the communication is obvious; and consequently they have a much greater facility of taking a long and large inspiration. It is sometimes also seen that the wind-pipe makes many convolutions within the body of the bird, and it is then called the *labyrinth*; but of what use these convolutions are, or why the wind-pipe should make so many turnings within the body of some birds, is a difficulty for which no naturalist has been able to account.

This difference of the wind-pipe often obtains in animals that, to all appearance, are of the same species. Thus in the tame swan, the wind-pipe makes but a straight passage into the lungs; while in the wild swan, which, to all external appearance, seems the same animal, the wind-pipe pierces through the breast-bone, and there has several turnings before it comes out again, and goes to enter the lungs. It is not to form the voice that these turnings are found, since the fowls that are without them are vocal; and those, particularly the bird just now mentioned, that have them, are silent. Whence, therefore, some birds derive that loud and various modulation in their warblings, is not easily to be accounted for; at least the knife of the anatomists goes but a short way in the investigation. All we are certain of is, that birds have much louder voices, in respect to their bulk, than animals of any other kind; for the bellowing of an ox is not louder than the scream of a peacock.

In these particulars, birds pretty much resemble each other in their internal conformation; but there are some varieties which we should more attentively observe. All birds have, properly speaking, but one stomach; but this is very different in different kinds. In all the rapacious kinds, that live upon animal food, as well as in some of the fish feeding tribe, the stomach is peculiarly formed. The œsophagus, or gullet, in them, is found replete with glandulous bodies, which serve to dilate and macerate the food, as it passes into the stomach, which is always very large in proportion to the size of the bird, and generally wrapped round with fat, in order to increase its warmth and powers of digestion.

Granivorous birds, or such as live upon fruits, corn, and other vegetables, have their intestines differently formed from those of the rapacious kind. Their gullet dilates just above the breast-bone, and forms itself into a pouch or bag, called the crop. This is replete with salivary glands, which serve to moisten and soften the grain and other food which it contains. These glands are very numerous, with longitudinal openings, which emit a whitish and a viscous substance. After the dry food of the bird has been macerated for a convenient time, it then passes into the belly, where, instead of a soft, moist stomach, as in the rapacious kind, it is ground between two pair of muscles, commonly called the gizzard, covered on the one side with a stony, ridgy coat, and almost cartilaginous. These coats rubbing against each other, are capable of bruising and attenuating the hardest substances, their action being often compared to that of the grinding teeth in man and other animals. Thus the organs of digestion are in a manner reversed in birds. Beasts grind their food with their teeth, and then it passes into the stomach, where it is softened and digested. On the contrary, birds of this sort, first macerate and soften it in the crop, and then it is ground and comminuted in the stomach or gizzard. Birds are also careful to pick up sand, gravel, and other hard substances, not to grind their food, as has been supposed, but to prevent the too violent action of the coats of the stomach against each other.

Most birds have two appendices, or blind-guts, which, in quadrupeds, are always found single. Among such birds as are thus supplied, all carnivorous fowl, and all birds of the sparrow kind, have very small and short ones; water-fowl, and birds of the poultry kind, the longest of all. There is still another appendix observable in the intestines of birds, resembling a little worm, which is nothing more than the remainder of that passage by which the yolk was conveyed into the guts of the young chicken, while yet in the egg and under incubation.

The outlet of that duct which conveys the bile into the intestines is, in most birds, a great way distant from the stomach; which may arise from the danger there would be of the bile regurgitating into the stomach in their various rapid motions, as we see in men at sea; wherefore their biliary duct is so contrived, that this regurgitation cannot take place.

All birds, though they want a bladder for urine, have large kidneys and ureters, by which this secretion is made, and carried away by one common canal. " Birds," says Harvey, " as well as serpents, which have spongy lungs, make but little water, because they drink but little. They therefore have no need of a bladder; but their urine distils down into the common canal, designed for receiving the other excrements of the body. The urine of birds differs from that of other animals: for, as there is usually in urine two parts, one more serous and liquid, the other more thick and gross, which subsides to the bottom; in birds, the last part is most abundant, and is distinguished from the rest by its white or siluer colour. This part is found not only in the whole intestinal canal, but is seen also in the whole channel of the ureters, which may be distinguished from the coats of the kidneys by their whiteness. This milky substance they have in greater plenty than the more thin and serous part; and it is of a middle consistence, between limpid urine and the grosser parts of the fæces. In passing through the ureters, it resembles milk curdled or lightly condensed; and, being cast forth, easily congeals into a chalky crust."

From this simple conformation of the animal, it should seem that birds are subject to fewer diseases; and, in fact, they have but few. There is one, however, which they are subject to, from which quadrupeds are, in a great measure, exempt; this is the annual moulting which they suffer; for all birds whatsoever obtain a new covering of feathers once a year, and cast the old. During the moulting season, they ever appear disordered; those most remarkable for their courage, then lose all their fierceness; and such as are of a weakly constitution, often expire under this natural operation. No feeding can maintain their strength; they all cease to breed at this season; that nourishment which goes to the production of the young, is wholly absorbed by the demand required for supplying the nascent plumage.

This moulting-time, however, may be artificially accelerated; and those who have the management of singing-birds, frequently put their secret in practice. They inclose the bird in a dark cage, where they keep it excessively warm, and throw the poor little animal into an artificial fever; this produces the moult; his old feathers fall before their time, and a new set take place, more brilliant and beautiful than the former. They add, that it mends the bird's singing, and increases its vivacity; but it must not be concealed, that scarce one bird in three survives the operation.

The manner in which nature performs this operation of moulting, is thus: the quill, or feather, when first protruded from the skin, and come to its full size, grows harder as it grows older, and receives a kind of periosteum or skin round the shaft, by which it seems attached to the animal. In proportion as the quill grows older, its sides, or the bony pen-part, thicken; but its whole diameter shrinks and decreases. Thus, by the thickening of its sides, all nourishment from the body becomes more sparing; and, by the decrease of its diameter, it becomes more loosely fixed in its socket, till at length it falls out. In the mean time, the rudiments of an incipient quill are beginning below. The skin forms itself into a little bag, which is fed from the body by a small vein and artery, and which every day increases in size, till it is protruded. While the one end vegetates into the beard or vane of the feather, that part attached to the skin is still soft, and receives a constant supply of nourishment, which is diffused through the body of the quill by that little light substance which we always find within when we make a pen. This substance, which as yet has received no name that I know of, serves the growing quill as the umbilical artery does an infant in the womb, by supplying it with nourishment, and diffusing that nourishment over the whole frame. When, however, the quill is come to its full growth, and requires no farther nourishment, the vein and artery become less and less, till at last the little opening by which they communicated with the quill becomes wholly obliterated; and the quill, thus deprived, continues in its socket for some months, till in the end it shrinks, and leaves room for a repetition of the same process of nature as before.

The moulting season commonly obtains from the end of summer to the middle of autumn. The bird continues to struggle with this malady during the winter; and nature has kindly provided, that when there are the fewest provisions, that then the animal's appetite shall be least craving. At the beginning of spring, when food begins again to be plentiful, the animal's strength and vigour return. It is then that the abundance of provisions, aided by the mildness of the season, incite it to love, and all nature seems teeming with life, and disposed to continue it.

CHAPTER II.

OF THE GENERATION, NESTLING, AND INCUBATION OF BIRDS.

The return of spring is the beginning of pleasure. Those vital spirits, which seemed locked up during the winter, then begin to expand; vegetables and insects supply abundance of food; and the bird, having more than a sufficiency for its own subsistence, is impelled to transfuse life, as well as to maintain it. Those warblings which had been hushed during the colder seasons, now begin to animate the fields; every grove and bush resounds with the challenge of anger, or the call of allurement. This delightful concert of the grove, which is so much admired by man, is no way studied for his amusement: it is usually the call of the male to the female; his efforts to sooth her during the times of incubation; or it is a challenge between two males, for the affections of some common favourite.

It is by this call that birds begin to pair at the approach of spring, and provide for the support of a future progeny. The loudest notes are usually from the male, while the hen seldom expresses her consent, but in a short, interrupted twittering. This compact, at least for the season, holds with unbroken faith: many birds live with inviolable fidelity together for a constancy; and when one dies, the other is always seen to share the same fate soon after. We must not take our idea of the conjugal fidelity of birds, from observing the poultry in our yards, whose freedom is abridged, and whose manners are totally corrupted by slavery. We must look for it in our fields and our forests, where nature continues in unadulterated simplicity; where the number of males is generally equal to that of females; and where every little animal seems prouder of his progeny, than pleased with his mate. Were it possible to compare sensations, the male of all wild birds seems as happy in the young brood as the female; and all his former caresses, all his soothing melodies, seem only aimed at that important occasion when they are both to become parents, and to educate a progeny of their own producing. The pleasures of love appear dull in their effects, when compared to the interval immediately after the exclusion of their young. They both seem at that season transported with pleasure; every action testifies their pride, their importance, and their tender solicitude.

When the business of fecundation is performed, the female then begins to lay. Such eggs as have been impregnated by the cock are prolific; and such as have not, for she lays often without any congress whatsoever, continue barren, and are only addled by incubation. Previous, however, to laying, the work of nestling becomes the common care; and this is performed with no small degree of assiduity and apparent design. It has been asserted, that birds of one kind always make their nests in the same manner, and of the same materials: but the truth is, that they vary this as the materials, places, or climates, happen to differ. The red-breast, in some parts of England, makes its nest with oak leaves, where they are in the greatest plenty; in other parts with moss and hair. Some birds, that with us make a very warm nest, are less solicitous in the tropical climates, where the heat of the weather promotes the business of incubation. In general, however, every species of birds has a peculiar architecture of its own; and this adapted to the number of eggs, the temperature of the climate, or the respective heat of the little animal's own body. Where the eggs are numerous, it is then incumbent to make the nest warm, that the animal heat may be equally diffused to them all. Thus the wren, and all the small birds, make the nest very warm; for having many eggs, it is requisite to distribute warmth to them in common: on the contrary, the plover, that has but two eggs, the eagle and the crow, are not so solicitous in this respect, as their bodies are capable of being applied to the small number upon which they sit. With regard to climate, water-fowl, that with us make but a very slovenly nest, are much more exact in this particular in the colder regions of the north. They there take every precaution to make it warm; and some kinds strip the down from their breasts, to line it with greater security.

In general, however, every bird resorts to hatch in those climates or places where its food is found in greatest plenty; and always at that season when provisions are in the greatest abundance. The large birds, and those of the aquatic kinds, choose places as remote from man as possible, as their food is in general different from that which is cultivated by human labour. Some birds, which have only the serpent to fear, build their nests depending from the end of a small bough, and form the entrance from below; being thus secured either from the serpent or the monkey tribes. But all the little birds which live upon fruits and corn, and that are too often unwelcome intruders upon the fruits of human industry, in making their nests, use every precaution to conceal them from man. On the other hand, the great birds, remote from human society, use every precaution to render theirs inaccessible to wild beasts or vermin.

Nothing can exceed the patience of birds while hatching; neither the calls of hunger, nor the near approach of danger, can drive them from the nest. They are often fat upon beginning to sit, yet before incubation is over, the female is usually wasted to skin and bone. Ravens and crows, while the females are sitting, take care to provide them with food; and this in great abundance. But it is different with most of the smaller kinds: during the whole time, the male sits near his mate upon some tree, and soothes her by his singing; and often when she is tired, takes her place, and patiently continues upon the nest till she returns. Sometimes, however, the eggs acquire a degree of heat too much for the purposes of hatching; in such cases, the hen leaves them to cool a little, and then returns to sit with her usual perseverance and pleasure.

So great is the power of instinct, in animals of this class, that they seem driven from one appetite to another, and continue almost passive under its influence. Reason we cannot call it, since the first dictates of that principle would be self-preservation:—"Take a brute," says

Addison, "out of his instinct, and you find him wholly deprived of understanding. With what caution," continues he, "does the hen provide herself a nest in places unfrequented, and free from noise and disturbance! When she has laid her eggs in such a manner that she can cover them, what care does she take in turning them frequently, that all parts may partake of the vital warmth! When she leaves them to provide for her necessary sustenance, how punctually does she return before they have time to cool, and become incapable of producing an animal! In the summer you see her giving herself greater freedoms, and quitting her care for above two hours together: but in winter, when the rigour of the season would chill the principles of life, and destroy the young one, she grows more assiduous in her attendance, and stays away but half the time. When the birth approaches, with how much nicety and attention does she help the chick to break the prison! not to take notice of her covering it from the injuries of the weather, providing it with proper nourishment, and teaching it to help itself; nor to mention her forsaking the nest, if, after the usual time of reckoning, the young one does not make its appearance. A chymical operation could not be followed with greater art or diligence than is seen in hatching a chick, though there are many birds that show an infinitely greater sagacity: yet at the same time the hen, that has all this seeming ingenuity, (which is indeed absolutely necessary for the propagation of the species,) considered in other respects, is without the least glimmerings of thought or common sense: she mistakes a piece of chalk for an egg, and sits upon it in the same manner; she is insensible of any increase or diminution in the number of those she lays; she does not distinguish between her own, and those of another species; and when the birth appears of never so different a bird, will cherish it for her own. A hen followed by a brood of ducks, shall stand affrighted at the edge of the pond, trembling for the fate of her young, which she sees venturing into so dangerous an element. As the different principle which acts in these different animals cannot be termed reason, so when we call it instinct, we mean something we have no knowledge of. It appears to me the immediate direction of Providence; and such an operation of the Supreme Being, as that which determines all the portions of matter to their proper centres."

The production of the young, as was said, seems to be the great æra of a bird's happiness. Nothing can at that time exceed its spirit and industry: the most timid becomes courageous in the defence of its young. Birds of the rapacious kind, at this season, become more than usually fierce and active. They carry their prey, yet throbbing with life, to the nest, and early accustom their young to habits of slaughter and cruelty. Nor are those of milder natures less busily employed; the little birds then discontinue their singing, taken up with more important pursuits of common subsistence.

While the young are yet unfledged, and continue in the nest, the old ones take care to provide them with a regular supply; and, lest one should take all nourishment from the rest, they feed each of the young in their turn. If they perceive that man has been busy with their nest, or has handled the little ones, they abandon the place by night, and provide their brood a more secure, though less commodious retreat. When the whole family is completely plumed, and capable of avoiding danger by flight, they are then led forth when the weather is fine, and taught the paternal art of providing for their subsistence. They are led to the places where their food lies; they are shown the method of discovering or carrying it away; and then led back to the nest for a day or two longer. At length, when they are completely qualified to shift for themselves, the old ones take them abroad, and leading them to the accustomed places, forsake them for the last time, and all future connexion is ever at an end.

Those birds which are hatched and sent out earliest in the season, are the most strong and vigorous; those, on the other hand, that have been delayed till the midst of summer, are more feeble and tender, and sometimes incapable of sustaining the rigours of the ensuing winter. Birds themselves seem sensible of this difference, and endeavour to produce early in the spring. If, however, their efforts are obstructed by having their nests robbed, or some similar accident, they still persevere in their efforts for a progeny; and it often happens that some are thus retarded till the midst of winter. What number of eggs any bird can lay in the course of a season is not ascertained; but this is true, that such as would have laid but two or three at the most, if their nests be robbed, or their eggs stolen, will lay above ten or twelve. A common hen, if moderately fed, will lay above a hundred from the beginning of spring to the latter end of autumn. In general, however, it obtains, that the smallest and weakest animals are the most prolific, while the strong and rapacious are abridged by sterility. Thus, such kinds as are easily destroyed, are readily repaired; and nature, where she has denied the power of resistance, has compensated by the fertility attending procreation.

Birds, in general, though they have so much to fear from man and each other, are seldom scared away from their usual haunts. Although they be so perfectly formed for a wandering life, and are supplied with powers to satisfy all their appetites, though never so remote from the object, though they are so well fitted for changing place with ease and rapidity, yet the greater number remain contented in the districts where they have been bred, and by no means exert their desires in proportion to their endowments. The rook, if undisturbed, never desires to leave his native grove; the black-bird still frequents its accustomed hedge; and the red-breast, though seemingly mild, claims a certain district, from whence he seldom moves, but drives out every one of the same species from thence without pity. They are excited to migration by no other motives but those of fear, climate, or hunger. It must be from one of these powerful motives that the birds, which are called birds of passage, every year forsake us for some time, and make their regular and expected return.

Nothing has more employed the curiosity of mankind than these annual emigrations; and yet few subjects continue so much involved in darkness. It is generally believed, that the cause of their retreat from these parts of Europe, is either a scarcity of food at certain seasons, or the want of a secure asylum from the persecution of man during the time of courtship and bringing up their young. Thus the starling, in Sweden, at the approach of winter, finding subsistence no longer in that kingdom, descends every year into Germany; and the hen chaffinches of the same country are seen every year to fly through Holland in large flocks, to pass their winter in a milder climate. Others, with a more daring spirit, prepare for journeys that might intimidate even human perseverance. Thus the quails, in spring, forsake the burning heats of Africa for the milder sun of Europe; and, when they have passed the summer with us, steer their flight back, to enjoy in Egypt the temperate air, which then begins to be delightful. This, with them, seems a preconcerted undertaking. They unite together in some open place, for some days before their departure, and, by an odd kind of chattering, seem to debate on the method to proceed. When their plan is resolved upon, they all take flight together, and often appear in such numbers, that to mariners at sea, they seem like a cloud that rests upon the horizon. The boldest, strongest, and by far the greatest number, make good their intention; but many there are who, not well apprised of their own force for the undertaking, grow weary in the way, and, quite spent by the fatigues of their flight, drop down into the sea, and sometimes upon deck, thus becoming an easy prey to the mariner.

Of the vast quantity of water-fowl that frequent our shores, it is amazing to reflect how few are known to breed here. The cause that principally urges them to leave this country, seems to be not merely the want of food, but the desire of a secure retreat. Our country is too populous for birds so shy and timid as the greatest number of these are. When great part of our island was a mere waste, an uncultivated tract of woods and marshes, many species of birds which now migrate remained with us throughout the year. The great heron and the crane, that have now forsaken this country, in former times bred familiarly in our marshes, and seemed to animate our fens. Their nests, like those of most cloven-footed water-fowl, were built on the ground, and exposed to every invader. But as rural economy increased, these animals were more and more disturbed. Before, they had had little to fear, as the surrounding marsh defended them from all the carnivorous quadrupeds, and their own strength from birds of prey; but upon the intrusion of man, and by a long series of alarms, they have at length been obliged to seek, during the summer, some lonely habitation, at a safe distance from every destroyer.

Of the numerous tribes of the duck kind, we know of no more than five that breed here; the tame swan, the tame goose, the sheldrake, the eider duck, and a few of the wild ducks. The rest contribute to form that amazing multitude of water-fowl which annually repair to the dreary lakes and deserts of Lapland from the more southern countries of Europe. In those extensive and solitary retreats, they perform the duties of incubation and nutrition in full security. There are few of this kind that may not be traced to the northern deserts, to countries of lakes, rivers, swamps, and mountains, covered with thick and gloomy forests, that afford shelter during summer to the timid animals, who live there in undisturbed security. In those regions, from the thickness of the forests, the ground remains moist and penetrable during the summer season; the woodcock, the snipe, and other slender-billed birds, can there feed at ease; while the web-footed birds find more than sufficient plenty of food from the number of insects, which swarm there to an incredible degree. The days there are long; and the beautiful meteorous nights afford them opportunity of collecting so minute a food, which is probably of all other the most grateful. We are not to be astonished, therefore, at the amazing number of fowl that descend from these regions at the approach of winter; numbers to which the army of Xerxes was but trifling in comparison; and which Linnæus has observed for eight whole days and nights to cover the surface of the river Calix.

This migation from the north usually begins in September, when they quit their retreats, and disperse themselves over all the southern parts of Europe. It is not unpleasing to observe the order of their flight; they generally range themselves in a long line, or they sometimes make their march angularly, two lines uniting in the centre like the letter V reversed. The bird which leads at the point seems to cleave the air to facilitate the passage for those which are to follow. When fatigued with this laborious station, it falls back into one of the wings of the file, while another takes its place. With us they make their appearance about the beginning of October, circulate first round our shores, and, when compelled by severe frost, betake themselves to our lakes and rivers. Some, indeed, of the web-footed fowl, of hardier constitutions than the rest, abide the rigours of their northern climate the whole winter; but when the cold reigns there with more than usual severity, they are obliged to seek for more southern skies. They then repair with the rest for shelter to these kingdoms; so that the diver, the wild swan, and the swallow-tailed sheldrake, visit our coasts but seldom, and that only when compelled by the severity of their winters at home.

It has been often a subject of astonishment, how animals, to all appearance so dull and irrational, should perform such long journies; should know whither to steer, and when to set out upon such a great undertaking. It is probable that the same instinct which governs all their other actions operates also here. They rather follow the weather than the country; they steer only from colder or warmer climates into those of an opposite nature; and finding the variations of the air as they proceed in their favour, go on till they find land to repose on. It cannot be supposed that they have any memory of the country where they might have spent a former winter; it cannot be supposed that they see the country to which they travel, from their height in the air; since, though they mounted for miles, the convexity of the globe would intercept their view; it must therefore only be, that they go on as they continue to perceive the atmosphere more suitable to their present wants and dispositions.

All this seems to be pretty plain: but there is a circumstance attending the migration of swallows which wraps this subject in great obscurity. It is agreed on all hands, that they are seen migrating into warmer climates, and that in amazing numbers, at the approach of the European winter. Their return into Europe is also as well attested about the beginning of summer. But we have another account, which serves to prove that numbers of them continue torpid here during the winter; and, like bats, make their retreat into old walls, the hollow of trees, or even sink into the deepest lakes, and find security for the winter season by remaining there in clusters at the bottom. However this latter circumstance may be, their retreat into old walls is too well authenticated to remain a doubt at present. The difficulty, therefore, is to account for this difference in these animals thus variously preparing to encounter the winter. It was supposed that in some of them the blood might lose its motion by the cold, and that thus they were rendered torpid by the severity of the season; but Mr. Buffon having placed many of this tribe in an ice-house, found that the same cold by which their blood was congealed was fatal to the animal; it remains, therefore, a doubt to this hour, whether there may not be a species of swallows to all external appearance like the rest, but differently formed within, so as to fit them for a state of insensibility during the winter here. It was suggested, indeed, that the swallows found thus torpid, were such only as were too weak to undertake the migration, or were hatched too late to join the general convoy; but it was upon these that Mr. Buffon tried his experiment; it was these that died under the operation.

Thus there are some birds which, by migrating, make a habitation of every part of the earth; but in general every climate has birds peculiar to itself. The feathered inhabitants of the temperate zone are but little remarkable for the beauty of their plumage; but then the smaller kinds make up for this defect by the melody of their voices. The birds of the torrid zone are very bright and vivid in their colours; but they have screaming voices, or are totally silent. The frigid zone, on the other hand, where the seas abound with fish, are stocked with birds of the aquatic kind, in much greater plenty than in Europe; and these are generally clothed with a warmer coat of feathers; or they have large quantities of fat lying underneath the skin, which serves to defend them from the rigours of the climate.

In all countries, however, birds are a more long-lived class of animals than the quadrupeds or insects of the same climate. The life of man himself is but short, when compared to what some of them enjoy. It is said that swans have been known to live three hundred years; geese are often seen to live fourscore; while linnets and other little birds, though imprisoned in cages, are often found to reach fourteen or fifteen. How birds, whose age of perfection is much more early than that of quadrupeds, should yet live comparatively so much longer, is not easily to be accounted for: perhaps, as their bones are slighter, and more porous, than those of quadrupeds, there are fewer obstructions in the animal machine; and nature, thus finding more room for the operations of life, is carried on to a greater extent.

All birds in general are less than quadrupeds; that is, the greatest of one class far surpasses the greatest of the other in magnitude. The ostrich, which is the greatest of birds, bears no proportion to the elephant; and the smallest humming-bird, which is the least of the class, is still far more minute than the mouse. In these the extremities of nature are plainly discernible; and in forming them she appears to have been doubtful in her operations: the ostrich, seemingly covered with hair, and incapable of flight, making near approaches to the quad ruped class; while the humming-bird, of the size of a humble-bee, and with a fluttering motion, seems nearly allied to the insect.

These extremities of this class are rather objects of human curiosity than utility: it is the middle order of birds which man has taken care to propagate and maintain. Of those which he has taken under his protection, and which administer to his pleasures or necessities, the greatest number seem creatures of his formation. The variety of climate to which he consigns them, the food with which he supplies them, and the purposes for which he employs them, produce amazing varieties, both in their colours, shape, magnitude, and the taste of their flesh. Wild birds are, for the most part, of the same magnitude and shape; they still keep the prints of primæval nature strong upon them, except in a few; they generally maintain their very colour: but it is otherwise with domestic animals; they change at the will of man—of the tame pigeon, for instance, it is said that they can be bred to a feather.

As we are thus capable of influencing their form and colour, so also is it frequent to see equal instances of our influencing their habitudes, appetites, and passions. The cock. for instance, is artificially formed into that courage and activity which he is seen to possess; and many birds testify a strong attachment to the hand that feeds them: how far they are capable of instruction, is manifest to those who have the care of hawks. But a still more surprising instance of this was seen some time ago in London: a canary bird was taught to pick up the letters of the alphabet, at the word of command, so as to spell any person's name in company; and this the little animal did by motions from its master, which were imperceptible to every other spectator. Upon the whole, however, they are inferior to quadrupeds in docility; and seem more mechanically impelled by all the power of instinct.

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CHAPTER III.

OF THE DIVISION OF BIRDS.

Though birds are fitted for sporting in air, yet as they find their food upon the surface of the earth, there seems a variety equal to the different aliments with which it tends to supply them. The flat and burning desert, the rocky cliff, the extensive fen, the stormy ocean, as well as the pleasing landscape, have all their peculiar inhabitants. The most obvious distinction therefore of birds, is into those that live by land and those that live by water; or, in other words, into *land birds*, and *water-fowl.*

It is no difficult matter to distinguish land from water-fowl, by the legs and toes. All land birds have their toes divided, without any membrane or web between them; and their legs and feet serve them for the purposes of running, grasping, or climbing. On the other hand, water-fowl have their legs and feet formed for the purposes of wading in water, or swimming on its surface. In those that wade, the legs are usually long and naked; in these that swim, the toes are webbed together, as we see in the feet of a goose, which serve, like oars, to drive them forward with greater velocity. The formation, therefore, of land and water-fowl, is as distinct as their habits; and nature herself seems to offer us this obvious distribution, in methodising animals of the feathered creation.

However, a distinction so comprehensive, goes but a short way in illustrating the different tribes of so numerous a class. The number of birds already known, amounts to nearly three thousand; and every person who turns his mind to these kind of pursuits, is every day adding to the catalogue. It is not enough, therefore, to be able to distinguish a land from a water-fowl; much more is still required—to be able to distinguish the different kinds of birds from each other; and even the varieties in the same kind, when they happen to offer. This certainly is a work of great difficulty; and perhaps the attainment will not repay the labour. The sensible part of mankind will not withdraw all their attention from more important pursuits, to give it entirely up to what promises to repay them only with a very confined species of amusement. In my distribution of birds, therefore, I will follow Linnæus in the first sketch of his system; and then leave him, to follow the most natural distinctions, in enumerating the different kinds that admit of a history, or require a description.

Linnæus divides all birds into six classes; namely, into birds of the *rapacious kind*, birds of the *pie kind*, birds of the *poultry kind*, birds of the *sparrow kind*, birds of the *duck kind*, and birds of the *crane kind*. The four first comprehend the various kinds of land birds; the two last, those that belong to the water.

Birds of the *rapacious kind*, constitute that class of carnivorous fowl that live by rapine. He distinguishes them by their beak, which is hooked, strong, and notched at the point; by their legs, which are short and muscular, and made for the purposes of tearing; by their toes, which are strong and knobbed; and their talons, which are sharp and crooked; by the make of their body, which is muscular; and their flesh, which is impure: nor are they less known by their food, which consists entirely of flesh; their stomach, which is membranous; and their manners, which are fierce and cruel.

Birds of the *pie kind* have the bill differing from the former: as in those it resembled a hook, destined for tearing to pieces; in these it resembles a wedge, fitted for the purpose of cleaving. Their legs are formed short and strong, for walking; their body is slender and impure, and their food miscellaneous. They nestle in trees; and the male feeds the female during the time of incubation.

Birds of the *poultry kind* have the bill a little convex, for the purposes of gathering their food. The upper chap hangs over the lower; their bodies are fat and muscular, and their flesh white and pure. They live upon grain, which is moistened in the crop. They make their nest on the ground, without art; they lay many eggs, and use promiscuous venery

Birds of the *sparrow kind* comprehend all that beautiful and vocal class that adorn our fields and groves, and gratify every sense in its turn. Their bills may be compared to a forceps that catches hold; their legs are formed for hopping along; their bodies are tender, pure in such as feed upon grain, impure in such as live upon insects. They live chiefly in trees; their nests are artificially made, and their amours are observed with connubial fidelity.

Birds of the *duck kind* use their bills as a kind of strainer to their food; it is smooth, covered with a skin, and nervous at the point. Their legs are short, and their feet formed for swimming, the toes being webbed together. Their body is fat, inclined to rancidity. They live in waters, and chiefly build their nests upon land.

With respect to the order of birds that belong to the waters, those of the *crane kind* have the bill formed for the purposes of searching and examining the bottom of pools; their legs are long, and formed for wading; their toes are not webbed; their thighs are half naked; their body is slender, and covered with a very thin skin; their tail is short, and their flesh savoury. They live in lakes upon animals, and they chiefly build their nests upon the ground.

Such is the division of Linnæus with respect to this class of animals; and, at first sight, it appears natural and comprehensive. But we must not be deceived by appearances: the student, who should imagine he was making a progress in the history of nature, while he was only thus making arbitrary distributions, would be very much mistaken. Should he come to enter deeper into this naturalist's plan, he would find birds the most unlike in nature thrown together into the same class; and find animals joined, that entirely differ in climate, in habitudes, in manners, in shape, colouring, and size. In such a distribution, for instance, he would find the humming-bird and the raven, the rail and the ostrich, joined in the same family. If, when he asked what sort of a creature was the humming-bird, he were told that it was in the same class with the carrion-crow, would he not think himself imposed upon? In such a case, the only way to form any idea of the animal whose history he desires to know, is to see it; and that curiosity very few have an opportunity of gratifying. The number of birds is so great, that it might exhaust the patience not only of the writer, but the reader, to examine them all: in the present confined undertaking it would certainly be impossible. I will, therefore, now attach myself to a more natural method; and, still keeping the general division of Linnæus before me, enter into some description of the most noted, or the most worth knowing.

Under one or other class, as I shall treat them, the reader will probably find all the species, and all the varieties that demand his curiosity. When the leader of any tribe is described, and its history known, it will give a very tolerable idea of all the species contained under it. It is true, the reader will not thus have his knowledge ranged under such precise distinctions; nor can he be able to say with such fluency, that the rail is of the ostrich class; but, what is much more material, he will have a tolerable history of the bird he desires to know, or at least of that which most resembles it in nature.

Ostrich, p. 45.

Cassowary, p. 52.

Dodo, p. 55.

To face p. 45, vol. iii.

However, it may be proper to apprise the reader that he will not here find his curiosity satisfied, as in the former volumes, where we often took Mr. Buffon for our guide. Those who have hitherto written the natural history of birds, have in general been contented with telling their names, or describing their toes or their plumage. It must often, therefore, happen, that instead of giving the history of a bird we must be content to entertain the reader with merely its description. I will therefore divide the following history of birds, with Linnæus, into six parts; in the first of which I will give such as Brisson has ranged among the rapacious birds; next those of the pie kind, and thus go on through the succeeding classes, till I finish with those of the duck kind. But before I enter upon a systematic detail, I will beg leave to give the history of three or four birds, that do not well range in any system. These, from their great size, are sufficiently distinguishable from the rest; and from their incapacity of flying, lead a life a good deal differing from the rest of the feathered creation. The birds I mean are the Ostrich, the Cassowary, the Emu, the Dodo, and the Solitaire.

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CHAPTER IV.

THE OSTRICH.

In beginning with the feathered tribe, the first animal that offers seems to unite the class of quadrupeds and of birds in itself. While it has the general outline and properties of a bird, yet it retains many of the marks of the quadruped. In appearance, the ostrich resembles the camel, and is almost as tall; it is covered with a plumage that resembles hair much more nearly than feathers, and its internal parts bear as near a similitude to those of the quadruped, as of the bird creation. It may be considered, therefore, as an animal made to fill up that chasm in nature which separates one class of beings from another.

The ostrich is the largest of all birds. Travellers affirm that they are seen as tall as a man on horseback; and even some of those that have been brought into England were above seven feet high. The head and bill somewhat resemble those of a duck; and the neck may be likened to that of a swan, but that it is much longer; the legs and thighs resemble those of a hen; though the whole appearance bears a strong resemblance to that of a camel. But to be more particular: it is usually seven feet high from the top of the head to the ground; but from the back it is only four; so that the head and neck are above three feet long. From the top of the head to the rump, when the neck is stretched out in a right line, it is six feet long, and the tail is about a foot more. One of the wings, without the feathers, is a foot and a half; and being stretched out, with the feathers, is three feet

The plumage is much alike in all; that is, generally black and white; though some of them are said to be gray. The greatest feathers are at the extremities of the wings and tail, and the largest are generally white. The next row is black and white; and of the small feathers on the back and belly, some are white and others black. There are no feathers on the sides, nor yet on the thighs, nor under the wings. The lower part of the neck, about half way, is covered with still smaller feathers than those on the belly and back; and those, like the former, also are of different colours.

All these feathers are of the same kind, and peculiar to the ostrich; for other birds have several sorts, some of which are soft and downy, and others hard and strong. Ostrich feathers are almost all as soft as down, being utterly unfit to serve the animal for flying, and still less adapted to be a proper defence against external injury. The feathers of other birds have the webs broader on one side than the other, but those of the ostrich have their shaft exactly in the middle. The upper part of the head and neck are covered with a very fine, clear, white hair, that shines like the bristles of a hog; and in some places there are small tufts of it, consisting of about twelve hairs, which grow from a single shaft about the thickness of a pin.

At the end of each wing, there is a kind of spur almost like the quill of a porcupine. It is an inch long, being hollow and of a horny substance. There are two of these on each wing; the largest of which is at the extremity of the bone of the wing, and the other a foot lower. The neck seems to be more slender in proportion to that of other birds, from its not being furnished with feathers. The skin in this part is of a livid flesh-colour, which some improperly would have to be blue. The bill is short and pointed, and two inches and a half at the beginning. The external form of the eye is like that of a man, the upper eye-lid being adorned with eye-lashes, which are longer than those on the lid below. The tongue is small, very short, and composed of cartilages, ligaments, and membranes, intermixed with fleshy fibres. In some it is about an inch long, and very thick at the bottom. In others it is but half an inch, being a little forked at the end.

The thighs are very fleshy and large, being covered with a white skin, inclining to redness, and wrinkled in the manner of a net, whose meshes will admit the end of a finger. Some have very small feathers here and there on the thighs; and others again have neither feathers nor wrinkles. What are called the legs of birds, in this are covered before with large scales. The end of the foot is cloven, and has two very large toes, which, like the leg, are covered with scales. These toes are of unequal sizes. The largest, which is on the inside, is seven inches long, including the claw, which is near three-fourths of an inch in length, and almost as broad. The other toe is but four inches long, and is without a claw.

The internal parts of this animal are formed with no less surprising peculiarity. At the top of the breast, under the skin, the fat is two inches thick; and on the fore part of the belly it is as hard as suet, and about two inches and a half thick in some places. It has two distinct stomachs. The first, which is lowermost, in its natural situation somewhat resembles the crop in other birds; but it is considerably larger than the other stomach, and is furnished with strong muscular fibres, as well circular as longitudinal. The second stomach, or gizzard, has outwardly the shape of the stomach of a man; and, upon opening, is always found filled with a variety of discordant substances: hay, grass, barley, beans, bones, and stones, some of which exceed in size a pullet's egg. The kidneys are eight inches long, and two broad, and differ from those of other birds in not being divided into lobes The heart and lungs are separated by a midriff, as in quadrupeds, and the parts of generation also bear a very strong resemblance and analogy.

Such is the structure of this animal, forming the shade that unites birds and quadrupeds; and from this structure its habits and manners are entirely peculiar. It is a native only of the torrid regions of Africa, and has long been celebrated by those who have had occasion to mention the animals of that region. Its flesh is proscribed in Scripture as unfit to be eaten; and most of the ancient writers describe it as well known in their times. Like the race of the elephant, it is transmitted down without mixture; and has never been known to breed out of that country which first produced it. It seems formed to live among the sandy and burning deserts of the torrid zone; and, as in some measure it owes its birth to their genial influence, so it seldom migrates into tracts more mild or more fertile. As that is the peculiar country of the elephant, the rhinoceros, and camel, so it may readily be supposed capable of affording a retreat to the ostrich. They inhabit, from preference, the most solitary and horrid deserts, where there are few vegetables to clothe the surface of the earth, and where the rain never comes to refresh it. The Arabians assert that the ostrich never drinks; and the place of its habitation seems to confirm the assertion. In these formidable regions, ostriches are seen in large flocks, which to the distant spectator appear like a regiment of cavalry, and have often alarmed a whole caravan. There is no desert, how barren soever, but what is capable of supplying these animals with provision; they eat almost every thing; and these barren tracts are thus doubly grateful, as they afford both food and security. The ostrich is of all other animals the most voracious. It will devour leather, glass, hair, iron, stones, or any thing that is given. Nor are its powers of digestion less in such things as are digestible. Those substances which the coats of the stomach cannot soften, pass whole; so that glass, stones, or iron, are excluded in the form in which they were devoured. All metals, indeed, which are swallowed by any animal, lose a part of their weight, and often the extremities of their figure, from the action of the juices of the stomach upon their surface. A quarter pistole, which was swallowed by a duck, lost seven grains of its weight in the gizzard before it was voided; and it is probable that a still greater diminution of weight would happen in the stomach of an ostrich. Considered in this light, therefore, this animal may be said to digest iron; but such substances seldom remain long enough in the stomach of any animal to undergo so tedious a dissolution. However this be, the ostrich swallows almost every thing presented to it. Whether this be from the necessity which smaller birds are under of picking up gravel to keep the coats of their stomach asunder, or whether it be from a want of distinguishing by the taste what substances are fit and what incapable of digestion; certain it is, that in the ostrich dissected by Ranby, there appeared such a quantity of heterogeneous substances, that it was wonderful how any animal could digest such an overcharge of nourishment. Valisnieri also found the first stomach filled with a quantity of incongruous substances; grass, nuts, cords, stones, glass, brass, copper, iron, tin, lead, and wood; a piece of stone was found among the rest that weighed more than a pound. He saw one of these animals that was killed by devouring a quantity of quicklime. It would seem that the ostrich is obliged to fill up the great capacity of its stomach in order to be at ease; but that nutritious substances not occurring, it pours in whatever offers to supply the void.

In their native deserts, however, it is probable they live chiefly upon vegetables, where they lead an inoffensive and social life; the male, as Thevenot assures us, assorting with the female with connubial fidelity. They are said to be very much inclined to venery; and the make of the parts in both sexes seems to confirm the report. It is probable also they copulate, like other birds, by compression; and they lay very large eggs, some of them being above five inches in diameter, and weighing above fifteen pounds. These eggs have a very hard shell, somewhat resembling those of the crocodile, except that those of the latter are less and rounder.

The season for laying depends on the climate where the animal is bred. In the northern parts of Africa, this season is about the beginning of July; in the south, it is about the latter end of December. These birds are very prolific, and lay generally from forty to fifty eggs at one clutch. It has been commonly reported that the female deposits them in the sand; and, covering them up, leaves them to be hatched by the heat of the climate, and then permits the young to shift for themselves. Very little of this, however, is true: no bird has a stronger affection for her young than the ostrich, nor none watches her eggs with greater assiduity. It happens, indeed, in those hot climates, that there is less necessity for the continual incubation of the female; and she more frequently leaves her eggs, which are in no fear of being chilled by the weather; but though she sometimes forsakes them by day, she always carefully broods over them by night; and Kolben, who has seen great numbers of them at the Cape of Good Hope, affirms that they sit on their eggs like other birds, and that the male and female take this office by turns, as he had frequent opportunities of observing. Nor is it more true what is said of their forsaking their young after they are excluded the shell. On the contrary, the young ones are not even able to walk for several days after they are hatched. During this time, the old ones are very assiduous in supplying them with grass, and very careful to defend them from danger: nay, they encounter every danger in their defence. It was a way of taking them among the ancients, to plant a number of sharp stakes round the ostrich's nest in her absence, upon which she pierced herself at her return. The young, when brought forth, are of an ash-colour the first year, and are covered with feathers all over. But, in time, these feathers drop; and those parts which are covered, assume a different and more becoming plumage.

The beauty of a part of this plumage, particularly the long feathers that compose the wings and tail, is the chief reason that man has been so active in pursuing this harmless bird to its deserts, and hunting it with no small degree of expense and labour. The ancients used those plumes in their helmets; the ladies of the east make them an ornament in their dress; and, among us, our undertakers and our fine gentlemen still make use of them to decorate their hearses and their hats. Those feathers which are plucked from the animal while alive, are much more valued than those taken when dead; the latter being dry, light, and subject to be worm-eaten.

Besides the value of their plumage, some of the savage nations of Africa hunt them also for their flesh, which they consider as a dainty. They sometimes also breed these birds tame, to eat the young ones, of which the female is said to be the greatest delicacy. Some nations have obtained the name of Struthophagi, or Ostrich-eaters, from their peculiar fondness for this food; and even the Romans themselves were not averse to it. Apicius gives us a receipt for making sauce for the ostrich; and Heliogabalus is noted for having dressed the brains of six hundred ostriches in one dish; for it was his custom never to eat but of one dish in a day, but that was an expensive one. Even among the Europeans now, the eggs of the ostrich are said to be well tasted, and extremely nourishing, but they are too scarce to be fed upon, although a single egg be a sufficient entertainment for eight men.

As the spoils of the ostrich are thus valuable, it is not to be wondered at that man has become their most assiduous pursuer. For this purpose the Arabians train up their best and fleetest horses, and hunt the ostrich still in view. Perhaps, of all other varieties of the chase, this, though the most laborious, is yet the most entertaining. As soon as the hunter comes within sight of his prey, he puts on his horse with a gentle gallop, so as to keep the ostrich still in sight; yet not so as to terrify him from the plain into the mountains. Of all known animals that make use of their legs in running, the ostrich is by far the swiftest; upon observing himself therefore pursued at a distance, he begins to run at first but gently; either insensible of his danger, or sure of escaping. In this situation he somewhat resembles a man at full speed; his wings, like two arms keep working with a motion correspondent to that of his legs: and his speed would very soon snatch him from the view of his pursuers; but, unfortunately for the silly creature, instead of going off in a direct line, he takes his course in circles; while the hunters still make a small course within, relieve each other, meet him at unexpected turns, and keep him thus still employed, still followed for two or three days together. At last, spent with fatigue and famine, and finding all power of escape impossible, he endeavours to hide himself from those enemies he cannot avoid, and covers his head in the sand, or the first thicket he meets. Sometimes, however, he attempts to face his pursuers; and, though in general the most gentle animal in nature, when driven to desperation, he defends himself with his beak, his wings, and his feet. Such is the force of his motion, that a man would be utterly unable to withstand him in the shock

The Struthophagi have another method of taking this bird; they cover themselves with an ostrich's skin, and passing up an arm through the neck, thus counterfeit all the motions of this animal. By this artifice they approach the ostrich, which becomes an easy prey. He is sometimes also taken by dogs and nets: but the most usual way is that mentioned above.

When the Arabians have thus taken an ostrich, they cut its throat, and making a ligature below the opening, they shake the bird, as one would rinse a barrel; then taking off the ligature, there runs out from the wound in the throat, a considerable quantity of blood, mixed with the fat of the animal; and this is considered as one of their greatest dainties. They next flay the bird; and of the skin, which is strong and thick, sometimes make a kind of vest, which answers the purposes of a cuirass and a buckler.

There are others who, more compassionate or more provident, do not kill their captive, but endeavour to tame it, for the purposes of supplying those feathers which are in so great request. The inhabitants of Dara and Lybia breed up whole flocks of them, and they are tamed with very little trouble. But it is not for their feathers alone that they are prized in this domestic state; they are often ridden upon, and used like horses. Moore assures us, that at Joar he saw a man travelling upon an ostrich; and Adanson asserts, that at the factory of Podore, he had two ostriches, which were then young, the strongest of which ran swifter than the best English racer, although he carried two negroes on his back. As soon as the animal perceived that it was loaded, it set off running with all its force, and made several circuits round the village, till at length the people were obliged to stop it, by barring up the way. How far this strength and swiftness may be useful to mankind, even in a polished state, is a matter that perhaps deserves inquiry. Posterity may avail themselves of this creature's abilities; and riding upon an ostrich may one day become the favourite, as it most certainly is the swiftest mode of conveyance.

The parts of this animal are said to be convertible to many salutary purposes in medicine. The fat is said to be emollient and relaxing; that while it relaxes the tendons, it fortifies the nervous system; and being applied to the region of the loins, it abates the pains of the stone in the kidneys. The shell of the egg powdered, and given in proper quantities, is said to be useful in promoting urine, and dissolving the stone in the bladder. The substance of the egg itself is thought to be peculiarly nourishing: however, Galen, in mentioning this, asserts, that the eggs of hens and pheasants are good to be eaten, those of geese and ostriches are worst of all.

CHAPTER V.

THE EMU.

Of this bird, which many call the American Ostrich, but little is certainly known. It is an inhabitant of the New Continent; and the travellers who have mentioned it, seem to have been more solicitous in proving its affinity to the ostrich, than in describing those peculiarities which distinguish it from all others of the feathered creation.

It is chiefly found in Guiana, along the banks of the Oroonoko, in the inland provinces of Brazil and Chili, and the vast forests that border on the mouth of the river Plata. Many other parts of South America were known to have them; but as men multiplied, these large and timorous birds either fell beneath their superior power, or fled from their vicinity.

The Emu, though not so large as the ostrich, is only second to it in magnitude. It is by much the largest bird in the New Continent; and is generally found to be six feet high, measuring from its head to the ground. Its legs are three feet long; and its thigh is near as thick as that of a man. The toes differ from those of the ostrich; as there are three in the American bird, and but two in the former. Its neck is long, its head small, and the bill flatted, like that of the ostrich; but in all other respects it more resembles a Cassowary, a large bird, to be described hereafter. The form of the body appears round; the wings are short, and entirely unfitted for flying, and it wants a tail. It is covered from the back and rump with long feathers, which fall backward, and cover the anus; these feathers are gray upon the back, and white on the belly. It goes very swiftly, and seems assisted in its motion by a kind of tubercle behind, like a heel, upon which, on plain ground, it treads very securely: in its course it uses a very odd kind of action, lifting up one wing, which it keeps elevated for a time; till letting it drop, it lifts up the other. What the bird's intention may be in thus keeping only one wing up, is not easy to discover; whether it makes use of this as a sail to catch the wind, or whether as a rudder to turn its course, in order to avoid the arrows of the Indians, yet remains to be ascertained: however this be, the emu runs with such swiftness, that the fleetest dogs are thrown out in the pursuit. One of them, finding itself surrounded by the hunters, darted among the dogs with such fury that they made way to avoid its rage; and it escaped, by its amazing velocity, in safety to the mountains.

As this bird is but little known, so travellers have given a loose to their imaginations in describing some of its actions, which they were conscious could not easily be contradicted. This animal, says Nierenberg, is very peculiar in the hatching of its young. The male compels twenty or thirty of the females to lay their eggs in one nest; he then, when they have done laying, chases them away, and places himself upon the eggs; however, he takes the singular precaution of laying two of the number aside, which he does not sit upon. When the young ones come forth, these two eggs are addled; which the male having foreseen, breaks one, and then the other, upon which multitudes of flies are found to settle; and these supply the young brood with a sufficiency of provision, till they are able to shift for themselves.

On the other hand, Wafer asserts, that he has seen great quantities of this animal's eggs on the desert shores, north of the river Plata, where they were buried in the sand, in order to be hatched by the heat of the climate. Both this, as well as the preceding account, may be doubted; and it is more probable that it was the crocodile's eggs which Wafer had seen, which are undoubtedly hatched in that manner.

When the young ones are hatched, they are familiar, and follow the first person they meet. I have been followed myself, says Wafer, by many of these young ostriches; which at first are extremely harmless and simple; but as they grow older, they become more cunning and distrustful; and run so swift, that a grey hound can scarcely overtake them. Their flesh, in general, is good to be eaten; especially if they be young. It would be no difficult matter to rear up flocks of these animals tame, particularly as they are naturally so familiar; and they might be found to answer domestic purposes, like the hen or the turkey. Their maintenance could not be expensive, if, as Narborough says, they live entirely upon grass.

CHAPTER VI.

THE CASSOWARY.

The Cassowary is a bird which was first brought into Europe by the Dutch, from Java, in the East Indies, in which part of the world it is only to be found. Next to the preceding, it is the largest and the heaviest of the feathered species.

The cassowary, though not so large as the former, yet appears more bulky to the eye; its body being nearly equal, and its neck and legs much thicker and stronger in proportion; this conformation gives it an air of strength and force, which the fierceness and singularity of its countenance conspire to render formidable. It is five feet and a half long, from the point of the bill to the extremity of the claws. The legs are two feet and a half high, from the belly to the end of the claws. The head and neck together are a foot and a half; and the largest toe, including the claw, is five inches long. The claw alone of the least toe, is three inches and a half in length. The wing is so small, that it does not appear, it being hid under the feathers of the back. In other birds, a part of the feathers serve for flight, and are different from those that serve merely for covering; but in the cassowary, all the feathers are of the same kind, and outwardly of the same colour. They are generally double, having two long shafts, which grow out of a short one, which is fixed in the skin. Those that are double, are always of an unequal length; for some are fourteen inches long, particularly on the rump; while others are not above three. The beards that adorn the stem or shaft, are, from about half way to the end, very long, and as thick as a horse-hair, without being subdivided into fibres. The stem or shaft is flat, shining, black, and knotted below; and from each knot there proceeds a beard: likewise the beards at the end of the large feathers are perfectly black; and towards the root, of a grey tawny colour; shorter, more soft, and throwing out fine fibres like down; so that nothing appears except the ends, which are hard and black; because the other part, composed of down, is quite covered. There are feathers on the head and neck; but they are so short and thinly sown, that the bird's skin appears naked, except towards the hinder part of the head, where they are a little longer. The feathers which adorn the rump are extremely thick, but do not differ, in other respects, from the rest, excepting their being longer. The wings, when they are deprived of their feathers, are but three inches long; and the feathers are like those on other parts of the body. The ends of the wings are adorned with five prickles, of different lengths and thickness, which bend like a bow: these are hollow from the roots to the very points, having only that slight substance within, which all quills are known to have. The longest of these prickles is eleven inches; and it is a quarter of an inch in diameter at the root, being thicker there than towards the extremity; the point seems broken off.

The part, however, which most distinguishes this animal, is the head: this, though small, like that of an ostrich, does not fail to inspire some degree of terror. It is bare of feathers, and is in a manner armed with a helmet of horny substance, that covers it from the root of the bill to near half the head backwards. This helmet is black before and yellow behind. Its substance is very hard, being formed by the elevation of the bone of the skull; and it consists of several plates, one over another, like the horn of an ox. Some have supposed that this was shed every year with the feathers; but the most probable opinion is, that it only exfoliates slowly like the beak. To the peculiar oddity of this natural armour may be added the colour of the eyes in this animal, which is a bright yellow, and the globe being above an inch and a half in diameter, gives it an air equally fierce and extraordinary. At the bottom of the upper eye-lid, there is a row of small hairs, over which there is another row of black hair, which look pretty much like an eye-brow. The lower eye-lid, which is the largest of the two, is furnished also with plenty of black hair. The hole of the ear is very large and open, being only covered with small black feathers. The sides of the head, about the eye and ear, being destitute of any covering, are blue, except the middle of the lower eye-lid, which is white. The part of the bill which answers to the upper jaw in other animals, is very hard at the edges above, and the extremity of it like that of a turkey-cock. The end of the lower mandible is slightly notched, and the whole is of a grayish brown, except a green spot on each side. As the beak admits a very wide open ing, this contributes not a little to the bird's menacing appearance The neck is of a violet colour, inclining to that of slate; and it is red behind in several places, but chiefly in the middle. About the middle of the neck before, at the rise of the large feathers, there are two processes formed by the skin, which resemble somewhat the gills of a cock, but that they are blue as well as red. The skin which covers the fore-part of the breast, on which this bird leans and rests, is hard, callous, and without feathers. The thighs and legs are covered with feathers, and are extremely thick, strong, straight, and covered with scales of several shapes; but the legs are thicker a little above the foot than in any other place. The toes are likewise covered with scales, and are but three in number; for that which should be behind is wanting. The claws are of a hard solid substance, black without and white within.

The internal parts are equally remarkable. The cassowary unites with the double stomach of animals that live upon vegetables, the short intestines of those that live upon flesh. The intestines of the cassowary are thirteen times shorter than those of the ostrich. The heart is very small, being but an inch and a half long, and an inch broad at the base. Upon the whole, it has the head of a warrior, the eye of a lion, the defence of a porcupine, and the swiftness of a courser.

Thus formed for a life of hostility, for terrifying others, and for its own defence, it might be expected that the cassowary was one of the most fierce and terrible animals of the creation. But nothing is so opposite to its natural character, nothing so different from the life it is contented to lead. It never attacks others; and, instead of the bill, when attacked, it rather makes use of its legs, and kicks like a horse, or runs against its pursuer, beats him down, and treads him to the ground.

The manner of going of this animal is not less extraordinary than its appearance. Instead of going directly forward, it seems to kick up behind with one leg, and then making a bound onward with the other, it goes with such prodigious velocity, that the swiftest racer would be left far behind.

The same degree of voraciousness which we perceive in the ostrich, obtains as strongly here. The cassowary swallows every thing that comes within the capacity of its gullet. The Dutch assert, that it can devour not only glass, iron, and stones, but even live and burning coals, without testifying the smallest fear, or feeling the least injury. It is said, that the passage of the food through its gullet is performed so speedily, that even the very eggs which it has swallowed whole, pass through it unbroken, in the same form they went down. In fact, the alimentary canal of this animal, as was observed above, is extremely short; and it may happen that many kinds of food are indigestible in its stomach, as wheat or currants are to man when swallowed whole.

The cassowary's eggs are of a grey ash colour, inclining to green. They are not so large nor so round as those of the ostrich. They are marked with a number of little tubercles of a deep green, and the shell is not very thick. The largest of these is found to be fifteen inches round one way, and about twelve the other

The southern parts of the most eastern Indies seem to be the natural climate of the cassowary. His domain, if we may so call it, begins where that of the ostrich terminates. The latter has never been found beyond the Ganges; while the cassowary is never seen nearer than the islands of Banda, Sumatra, Java, the Molucca Islands, and the corresponding parts of the continent. Yet even here this animal seems not to have multiplied in any considerable degree, as we find one of the kings of Java making a present of one of these birds to the captain of a Dutch ship, considering it as a very great rarity. The ostrich, that has kept in the desert and unpeopled regions of Africa, is still numerous, and the unrivalled tenant of its own inhospitable climate. But the cassowary, that is the inhabitant of a more peopled and polished region, is growing scarcer every day. It is thus that in proportion as man multiplies, all the savage and noxious animals fly before him: at his approach they quit their ancient habitations, how adapted soever they may be to their natures, and seek a more peaceable, though barren, retreat; where they willingly exchange plenty for freedom, and encounter all the dangers of famine, to avoid the oppressions of an unrelenting destroyer.

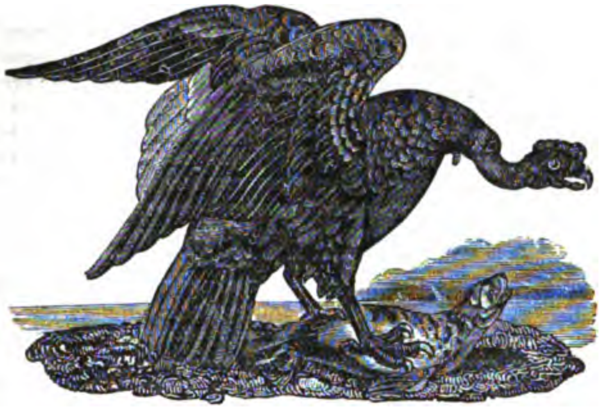
CHAPTER VII.

THE DODO.

Mankind have generally made swiftness the attribute of birds; but the dodo has no title to this distinction. Instead of exciting the idea of swiftness by its appearance, it seems to strike the imagination as a thing the most unwieldy and inactive of all nature. Its body is massive, almost round, and covered with gray feathers; it is just barely supported upon two short thick legs, like pillars, while its head and neck rise from it in a manner truly grotesque. The neck, thick and pursy, is joined to the head, which consists of two great chaps, that open far behind the eyes, which are large, black, and prominent; so that the animal, when it gapes, seems to be all mouth. The bill, therefore, is of an extraordinary length, not flat and broad, but thick, and of a bluish white, sharp at the end, and each chap crooked in opposite directions. They resemble two pointed spoons that are laid together by the backs. From all this results a stupid and voracious physiognomy, which is still more increased by a bordering of feathers round the root of the beak, and which gives the appearance of a hood or cowl, and finish this picture of stupid deformity. Bulk, which in other animals implies strength, in this only contributes to inactivity. The ostrich, or the cassowary, are no more able to fly than the animal before us; but then they supply that defect by their speed in running. The dodo seems weighed down by its own heaviness, and has scarcely strength to urge itself forward. It seems among birds what the sloth is among quadrupeds, an unresisting thing, equally incapable of flight or defence. It is furnished with wings, covered with soft ash-coloured feathers, but they are too short to assist it in flying. It is furnished with a tail, with a few small curled feathers; but this tail is disproportioned and displaced. Its legs are too short for running, and its body too fat to be strong. One would take it for a tortoise that had supplied itself with the feathers of a bird; and that thus dressed out with the instruments of flight, it was only still the more unwieldy.

This bird is a native of the Isle of France; and the Dutch, who first discovered it there, called it, in their language, the nauseous bird, as well from its disgusting figure as from the bad taste of its flesh. However, succeeding observers contradict this first report, and assert that its flesh is good and wholesome eating. It is a silly, simple bird, as may very well be supposed from its figure, and is very easily taken. Three or four dodos are enough to dine a hundred men.

Whether the dodo be the same bird with that which some travellers have described under the name of the bird of Nazareth, yet remains uncertain. The country from whence they both come is the same; their incapacity of flying is the same; the form of the wings and body in both are similar; but the chief difference given is in the colour of the feathers, which in the female of the bird of Nazareth are said to be extremely beautiful; and in the length of their legs, which in the dodo are short, in the other are described as long. Time and future observation must clear up these doubts; and the testimony of a single witness, who shall have seen both, will throw more light on the subject than the reasonings of a hundred philosophers.



Condor, p. 64.

Golden Eagle, p. 60

To face p. 56, vol. iii.

BOOK II

OF RAPACIOUS BIRDS.

CHAPTER I.

OF RAPACIOUS BIRDS IN GENERAL.*

There seems to obtain a general resemblance in all the classes of nature. As among quadrupeds, a part were seen to live upon the vegetable productions of the earth, and another part upon the flesh of each other; so among birds, some live upon vegetable food, and others by rapine, destroying all such as want force or swiftness to procure their safety. By thus peopling the woods with animals of different dispositions, nature has wisely provided for the multiplication of life; since, could we suppose that there were as many animals produced as there were vegetables supplied to sustain them, yet there might still be another class of animals formed, which could find a sufficient sustenance by feeding upon such of the vegetable feeders as happened to fall in the course of nature. By this contrivance, a greater number will be sustained upon the whole; for the numbers would be but very thin were every creature a candidate for the same food. Thus, by supplying a variety of appetites, nature has also multiplied life in her productions.

In thus varying their appetites, nature has also varied the form of the animal; and while she has given some an instinctive passion for animal food, she has also furnished them with powers to obtain it. All land-birds of the rapacious kinds are furnished with a large head, and a strong crooked beak, notched at the end, for the purpose of tearing their prey. They have strong short legs, and sharp crooked talons, for the purpose of seizing it. Their bodies are formed for war, being fibrous and muscular; and their wings for swiftness of flight, being well feathered and expansive. The sight of such as prey by day, is astonishingly quick; and such as ravage by night, have their sight so fitted as to see objects in darkness with extreme precision.

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* The animals of this order are all carnivorous: they associate in pairs, build their nests in the most lofty situations, and produce generally four young ones at a brood; and the female is mostly larger than the male. They consist of vultures, eagles, hawks, and owls.

Their internal parts are equally formed for the food they seek for Their stomach is simple and membranous, and wrapt in fat to increase the powers of digestion; and their intestines are short and glandular. As their food is succulent and juicy, they want no length of intestinal tube to form it into proper nourishment. Their food is flesh, which does not require a slow digestion to be converted into a similitude of substance to their own.

Thus formed for war, they lead a life of solitude and rapacity. They inhabit by choice the most lonely places, and the most desert mountains. They make their nests in the clefts of rocks, and on the highest and most inaccessible trees of the forest. Whenever they appear in the cultivated plain or the warbling grove, it is only for the purposes of depredation; and are gloomy intruders on the general joy of the landscape. They spread terror wherever they approach: all that variety of music which but a moment before enlivened the grove, at their appearing is instantly at an end: every order of lesser birds seek for safety, either by concealment or flight; and some are even driven to take protection with man, to avoid their less merciful pursuers.

It would indeed be fatal to all the smaller race of birds, if, as they are weaker than all, they were also pursued by all, but it is contrived wisely for their safety, that every order of carnivorous birds seek only for such as are of the size most approaching their own. The eagle flies at the bustard or the pheasant; the sparrow-hawk pursues the thrush and the linnet. Nature has provided that each species should make war only on such as are furnished with adequate means of escape. The smallest birds avoid their pursuers by the extreme agility, rather than the swiftness of their flight; for every order would soon be at an end, if the eagle, to its own swiftness of wing, added the versatility of the sparrow.

Another circumstance which tends to render the tyranny of these animals more supportable, is, that they are less fruitful than other birds, breeding but few at a time. Those of the larger kinds seldom produce above four eggs, often but two; those of the smaller kinds never above six or seven. The pigeon, it is true, which is their prey, never breeds above two at a time; but then she breeds every month in the year. The carnivorous kinds only breed annually, and, of consequence, their fecundity is small in comparison.

As they are fierce by nature, and are difficult to be tamed, so this fierceness extends even to their young, which they force from the nest sooner than birds of the gentler kind. Other birds seldom forsake their young till able completely to provide for themselves: the rapacious kinds expel them from the nest at a time when they still should protect and support them. This severity to their young proceeds from the necessity of providing for themselves. All animals that, by the conformation of their stomach and intestines, are obliged to live upon flesh, and support themselves by prey, though they may be mild when young, soon become fierce and mischievous, by the very habit of using those arms with which they are supplied by nature. As it is only by the destruction of other animals that they can subsist, they become more furious every day; and even the parental feelings are overpowered in their general habits of cruelty. If the power of obtaining a supply be difficult, the old ones soon drive their brood from the nest ot shift for themselves, and often destroy them in a fit of fury caused by hunger.

Another effect of this natural and acquired severity is, that almost all birds of prey are unsociable. It has long been observed by Aristotle, that all birds with crooked beaks and talons are solitary: like quadrupeds of the cat kind, they lead a lonely wandering life, and are united only in pairs, by that instinct which overpowers their rapacious habits of enmity with all other animals. As the male and female are often necessary to each other in their pursuits, so they sometimes live together; but except at certain seasons, they most usually prowl alone; and, like robbers, enjoy in solitude the fruits of their plunder.

All birds of prey are remarkable for one singularity, for which it is not easy to account. All the males of these birds are about a third less, and weaker than the females, contrary to what obtains among quadrupeds, among which the males are always the largest and the boldest: from thence the male is called by falconers a *tarcel;* that is, a tierce or third less than the other. The reason of this difference cannot proceed from the necessity of a larger body in the female for the purposes of breeding, and that her volume is thus increased by the quantity of her eggs; for in other birds, that breed much faster, and that lay in much greater proportion, such as the hen, the duck, or the pheasant, the male is by much the largest of the two.

Whatever be the cause, certain it is, that the females, as Willoughby expresses it, are of greater size, more beautiful and lovely for shape and colours, stronger, more fierce and generous than the males; whether it may be that it is necessary for the female to be thus superior, as it is incumbent upon her to provide, not only for herself but her young ones also.

These birds, like quadrupeds of the carnivorous kind, are all lean and meagre. Their flesh is stringy and ill-tasted, soon corrupting, and tinctured with the flavour of that animal food upon which they subsist. Nevertheless, Belonius asserts, that many people admire the flesh of the vulture and falcon, and dress them for eating, when they meet with any accident that unfits them for the chase. He asserts, that the osprey, a species of the eagle, when young, is excellent food; but he contents himself with advising us to breed these birds up for our pleasure rather in the field, than for the table.

Of land birds of a rapacious nature, there are five kinds. The eagle kind, the hawk kind, the vulture kind, the horned and the screech-owl kind. The distinctive marks of this class are taken from their claws and beak; their toes are separated; their legs are feathered to the heel; their toes are four in number, three before, one behind: their beak is short, thick and crooked.

The eagle kind is distinguished from the rest by his beak, which is straight till towards the end, when it begins to hook downwards.

The vulture kind is distinguished by the head and neck, which are without feathers.

The hawk kind by the beak, being hooked from the very root.

The horned owl by the feathers at the base of the bill standing forwards; and by some feathers on the head that stand out, resembling horns.

The screech-owl, by the feathers at the base of the bill standing forward and being without horns. A description of one in each kind, will serve for all the rest.

CHAPTER II.

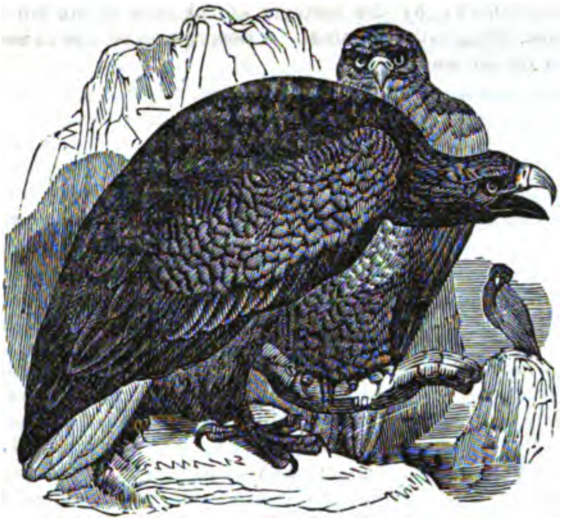
THE EAGLE AND ITS AFFINITIES.

The Golden Eagle is the largest and the noblest of all those birds that have received the name of eagle. It weighs above twelve pounds. Its length is three feet; the extent of its wings seven feet four inches; the bill is three inches long, and of a deep blue colour; and the eye of a hazel colour. The sight, and sense of smelling, are very acute. The head and neck are clothed with narrow sharp-pointed feathers, and of a deep brown colour, bordered with tawny; but those on the crown of the head, in very old birds, turn gray. The whole body, above as well as beneath, is of a dark brown; and the feathers of the back are finely clouded with a deeper shade of the same. The wings, when clothed, reach to the end of the tail. The quill-feathers are of a chocolate colour, the shafts white. The tail is of a deep brown, irregularly barred and blotched with an obscure ash-colour, and usually white at the roots of the feathers. The legs are yellow, short, and very strong, being three inches in circumference, and feathered to the very feet. The toes are covered with large scales, and armed with the most formidable claws, the middle of which are two inches long.

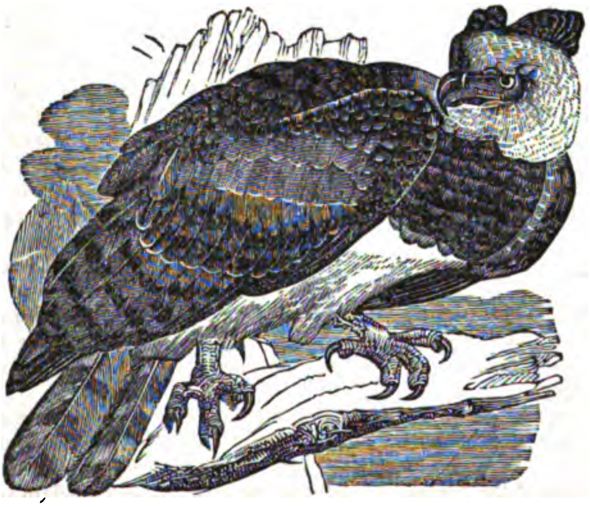
In the rear of this terrible bird follow the ring-tailed eagle, the common eagle, the bald eagle, the white eagle, the rough-footed eagle, the erne, the black eagle, the osprey, the sea-eagle, and the crowned eagle. These, and others that might be added, form different shades in this fierce family; but have all the same rapacity, the same general form, the same habits, and the same manner of bringing up their young.

In general, these birds are found in mountainous and ill-peopled countries, and breed among the loftiest cliffs. They choose those places which are remotest from man, upon whose possessions they but seldom make their depredations, being contented rather to follow the wild game in the forest, than to risk their safety to satisfy their hunger.

This fierce animal may be considered among birds as the lion among quadrupeds; and in many respects they have a strong similitude to each other. They are both possessed of force, and an empire over their fellows of the forest. Equally magnanimous, they disdain smaller plunder, and only pursue animals worthy the conquest. It is not till after having been long provoked by the cries of the rook, or the magpie, that this generous bird thinks fit to punish them with death: the



Great Sea Eagle, p. 64.



Oronooko Eagle (Harpy Eagle), p. 64.

To face p. 60, vol. iii.

eagle also disdains to share the plunder of another bird; and will take up with no other prey but that which he has acquired by his own pursuits. How hungry soever he may be, he never stoops to carrion; and when satiated, he never returns to the same carcass, but leaves it for other animals, more rapacious and less delicate than he. Solitary, like the lion, he keeps the desert to himself alone; it is as extraordinary to see two pair of eagles in the same mountain, as two lions in the same forest. They keep separate to find a more ample supply, and consider the quantity of their game as the best proof of their dominion. Nor does the similitude of these animals stop here: they have both sparkling eyes, and nearly of the same colour; their claws are of the same form, their breath equally strong, and their cry equally loud and terrifying. Bred both for war, they are enemies of all society: alike fierce, proud, and incapable of being easily tamed. It requires great patience and much art to tame an eagle; and even though taken young, and brought under by long assiduity, yet still it is a dangerous domestic, and often turns its force against its master. When brought into the field for the purposes of fowling, the falconer is never sure of its attachment; that innate pride, and love of liberty, still prompt it to regain its native solitudes; and the moment the falconer sees it, when let loose, first stoop towards the ground, and then rise perpendicularly into the clouds, he gives up all his former labour for lost; quite sure of never beholding his late prisoner more. Sometimes, however, they are brought to have an attachment for their feeder; they are then highly serviceable, and liberally provide for his pleasure and support. When the falconer lets them go from his hand, they play about and hover round him till their game presents, which they see at an immense distance, and pursue with certain destruction. Of all animals, the eagle flies highest; and from thence the ancients have given him the epithet of *the bird of heaven*. Of all others also, he has the quickest eye; but his sense of smelling is far inferior to that of the vulture. He never pursues, therefore, but in sight; and when he has seized his prey, he stoops from his height, as if to examine its weight, always laying it on the ground before he carries it off. Although his wing is very powerful, yet, as he has but little suppleness in the joints of the leg, he finds it difficult to rise when down; however, if not instantly pursued, he finds no difficulty in carrying off geese and cranes. He also carries away hares, lambs, and kids; and often destroys fawns and calves, to drink their blood, and carries a part of their flesh to his retreat. Infants themselves, when left unattended, have been destroyed by these rapacious creatures, which probably gave rise to the fable of Ganymede's being snatched up by an eagle to heaven.

An instance is recorded in Scotland of two children being carried off by eagles; but fortunately they received no hurt by the way; and, the eagles being pursued, the children were restored unhurt out of the nests to the affrighted parents.

The eagle is thus at all times a formidable neighbour; but peculiarly so when bringing up its young. It is then that the female, as well as the male, exert all their force and power of industry to supply their young. Smith, in his History of Kerry, relates that a poor man in that country got a comfortable subsistence for his family, during a summer of famine, out of an eagle's nest, by robbing the eaglets of food, which was plentifully supplied by the old ones. He protracted their assiduity beyond the usual time, by clipping the wings, and retarding the flight of the young; and very probably also, as I have known myself, by so tying them as to increase their cries, which is always found to increase the parent's despatch to procure them provision. It was lucky, however, that the old eagles did not surprise the countryman as he was thus employed, as their resentment might have been dangerous.

It happened some time ago, in the same country, that a peasant resolved to rob the nest of an eagle that had built in a small island in the beautiful lake of Killarney. He accordingly stripped, and swam in upon the island while the old ones were away; and, robbing the nest of its young, he was preparing to swim back, with the eaglets tied in a string; but while he was yet up to his chin in the water, the old eagles returned, and missing their young, quickly fell upon the plunderer, and in spite of all his resistance, despatched him with their beaks and talons.

In order to extirpate these pernicious birds, there is a law in the Orkney Islands, which entitles any person that kills an eagle to a hen out of every house in the parish in which the plunderer is killed.

The nest of the eagle is usually built in the most inaccessible cliff of the rock, and often shielded from the weather by some jutting crag that hangs over it. Sometimes, however, it is wholly exposed to the winds, as well sideways as above; for the nest is flat, though built with great labour. It is said that the same nest serves the eagle during life; and indeed the pains bestowed in forming it seems to argue as much. One of these was found in the Peak of Derbyshire, which Willoughby thus describes: "It was made of great sticks, resting one end on the edge of a rock, the other on two birch trees. Upon these was a layer of rushes, and over them a layer of heath, and upon the heath rushes again; upon which lay one young one, and an addle egg; and by them a lamb, a hare, and three heath-poults. The nest was about two yards square, and had no hollow in it. The young eagle was of the shape of a goshawk, of almost the weight of a goose, rough footed, or feathered down to the foot, having a white ring about the tail." Such is the place where the female eagle deposits her eggs, which seldom exceed two at a time in the larger species, and not above three in the smallest. It is said that she hatches them for thirty days; but frequently, even of this small number of eggs, a part is addled; and it is extremely rare to find three eaglets in the same nest. It is asserted, that as soon as the young ones are somewhat grown, the mother kills the most feeble or the most voracious. If this happens, it must proceed only from the necessities of the parent, who is incapable of providing for their support, and is content to sacrifice a part to the welfare of all.

The plumage of the eaglets is not so strongly marked as when they come to be adult. They are at first white; then inclining to yellow, and at last of a light brown. Age, hunger, long captivity, and diseases make them whiter. It is said they live above a hundred years, and that they at last die, not of old age, but from the beaks turning inward upon the under mandible, and thus preventing their taking any food

They are equally remarkable, says Mr. Pennant, for their longevity, and for their power of sustaining a long abstinence from food. One of this species, which has now been nine years in the possession of Mr. Owen Holland, of Conway, lived thirty-two years with the gentleman who made him a present of it; but what its age was when the latter received it from Ireland, is unknown. The same bird also furnishes a proof of the truth of the other remark, having once, through the neglect of servants, endured hunger for twenty-one days, without any sustenance whatever.

Those eagles which are kept tame, are fed with every kind of flesh, whether fresh or corrupting; and when there is a deficiency of that, bread, or any other provision, will suffice. It is very dangerous approaching them if not quite tame; and they sometimes send forth a loud piercing lamentable cry, which renders them still more formidable. The eagle drinks but seldom, and perhaps when at liberty, not at all, as the blood of its prey serves to quench its thirst. The eagle's excrements are always soft and moist, and tinged with that whitish substance which, as was said before, mixes in birds with the urine.

Such are the general characteristics and habitudes of the eagle; however, in some these habitudes differ, as the Sea Eagle and the Osprey live chiefly upon fish, and consequently build their nests on the sea-shore, and by the sides of rivers on the ground among reeds; and often lay three or four eggs, rather less than those of a hen, of a white elliptical form. They catch their prey, which is chiefly fish, by darting down upon them from above. The Italians compare the violent descent of these birds on their prey, to the fall of lead into water; and call them *aquila piombina*, or the Leaden Eagle.

Nor is the Bald Eagle, which is an inhabitant of North Carolina, less remarkable for habits peculiar to itself. These birds breed in that country all the year round. When the eaglets are just covered with down, and a sort of white woolly feathers, the female eagle lays again. These eggs are left to be hatched by the warmth of the young ones that continue in the nest, so that the flight of one brood makes room for the next that are but just hatched. These birds fly very heavily, so that they cannot overtake their prey, like others of the same denomination. To remedy this, they often attend a sort of fishing-hawk, which they pursue, and strip the plunderer of its prey. This is the more remarkable, as this hawk flies swifter than they. These eagles also generally attend upon fowlers in the winter, and when any birds are wounded, they are sure to be seized by the eagle, though they may fly from the fowler. This bird will often steal young pigs, and carry them alive to the nest, which is composed of twigs, sticks, and rubbish; it is large enough to fill the body of a cart, and is commonly full of bones half eaten, and putrid flesh, the stench of which is intolerable.

The distinctive marks of each species are as follow:—

The golden eagle: of a tawny, iron colour; the head and neck of a reddish iron; the tail feathers of a dirty white, marked with cross bands of tawny iron; the legs covered with tawny iron feathers.

The common eagle: of a brown colour; the head and upper part of the neck inclining to red; the tail feathers white, blackening at the ends; the outer ones, on each side, of an ash colour; the legs covered with feathers of a reddish brown.

The bald eagle: brown; the head, neck, and tail feathers white; the feathers of the upper part of the leg brown.

The white eagle: the whole white.

The rough-footed eagle: of a dirty brown; spotted under the wings, and on the legs, with white; the feathers of the tail white at the beginning and the point; the leg feathers dirty brown, spotted with white.

The white-tailed eagle: dirty brown; head white; stems of the feathers black; the rump inclining to black; the tail feathers, the first half black, the end half white; legs naked.

The erne: a dirty iron colour above, an iron mixed with black below; the head and neck ash, mixed with chesnut; the points of the wings blackish; the tail feathers white; the legs naked.

The black eagle: blackish; the head and upper neck mixed with red; the tail feathers, the first half white, speckled with black; the other half, blackish; the leg feathers dirty white.

The sea eagle: inclining to white, mixed with iron brown; belly white, with iron-coloured spots; the covert feathers of the tail whitish; the tail feathers black at the extremity; the upper part of the leg feathers of an iron brown.

The osprey: brown above, white below; the back of the head white; the outward tail feathers, on the inner side, streaked with white; legs naked.

The jean le blanc: above, brownish grey; below, white, spotted with tawny brown; the tail feathers, on the outside and at the extremity, brown; on the inside, white, streaked with brown; legs naked.

The eagle of Brasil: blackish brown; ash colour mixed in the wings; tail feathers white; legs naked.

The Oroonoko eagle: with a topping above, blackish brown; below, white, spotted with black; upper neck yellow; tail feathers brown, with white circles; leg feathers white spotted with black.

The crowned African eagle, with a topping; the tail of an ash colour, streaked on the upper side with black.

The eagle of Pondicherry: chesnut colour; the six outward tail feathers black one half.

CHAPTER III.

THE CONDOR OF AMERICA.

We might now come to speak of the vulture kind, as they hold the next rank to the eagle; but we are interrupted in our method, by the consideration of an enormous bird, whose place is not yet ascertained, as naturalists are in doubt whether to refer it to the eagle tribe, or to that of the vulture. Its great strength, force, and vivacity, might plead for its place among the former; the baldness of its head and neck might be thought to degrade it among the latter. In this uncertainty, it will be enough to describe the bird, by the lights we have, and leave future historians to settle its rank in the feathered creation. Indeed, if size and strength, combined with rapidity of flight and rapacity, deserve pre-eminence, no bird can be put in competition with it.

The Condor possesses, in a higher degree than the eagle, all the qualities that render it formidable, not only to the feathered kind, but to beasts, and even to man himself. Acosta, Garcilasso, and Desmarchais, assert, that it is eighteen feet across, the wings extended. The beak is so strong as to pierce the body of a cow; and two of them are able to devour it. They do not even abstain from man himself: but fortunately there are but few of the species; for if they had been plenty, every order of animals must have carried on an unsuccessful war against them. The Indians assert, that they will carry off a deer, or a young calf, in their talons, as eagles would a hare or a rabbit; that their sight is piercing, and their air terrible; that they seldom frequent the forests, as they require a large space for the display of their wings; but that they are found on the sea-shore, and the banks of rivers, whither they descend from the heights of the mountains. By later accounts we learn, that they come down to the sea shore only at certain seasons, when their prey happens to fail them upon land; that they then feed upon dead fish, and such other nutricious substances as the sea throws upon the shore. We are assured, however, that their countenance is not so terrible as the old writers have represented it; but that they appear of a milder nature than either the eagle or the vulture.

Condamine has frequently seen them in several parts of the mountains of Quito, and observed them hovering over a flock of sheep, and he thinks they would, at a certain time, have attempted to carry one off, had they not been scared away by the shepherds. Labat acquaints us, that those who have seen this animal, declare that the body is as large as that of a sheep, and that the flesh is tough, and as disagreeable as carrion. The Spaniards themselves seem to dread its depredations; and there have been many instances of its carrying off their children.

Mr. Strong, the master of a ship, as he was sailing along the coasts of Chili, in the thirty-third degree of south latitude, observed a bird sitting upon a high cliff near the shore, which some of the ship's company shot with a leaden bullet and killed. They were greatly surprised when they beheld its magnitude; for when the wings were extended, they measured thirteen feet from one tip to the other One of the quills was two feet four inches long: and the barrel, or hollow part, was six inches and three quarters, and an inch and a half in circumference.

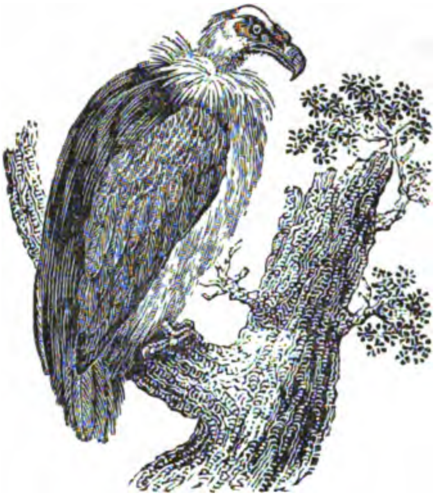
We have a still more circumstantial account of this amazing bird, by P. Feuillée, the only traveller who has accurately described it: "In the valley of Illo in Peru, I discovered a condor perched on a high rock before me: I approached within gun-shot and fired; but as my piece was only charged with swan-shot, the lead was not able sufficiently to pierce the bird's feathers. I perceived, however, by its manner of flying, that it was wounded; and it was with a good deal of difficulty that it flew to another rock, about five hundred yards distant, on the sea-shore. I therefore charged again with ball, and hit the bird under the throat, which made it mine. I accordingly ran up to seize it; but even in death it was terrible, and defended itself upon its back, with its claws extended against me, so that I scarce knew how to lay hold of it. Had it not been mortally wounded, I should have found it no easy matter to take it; but I at last dragged it down from the rock, and with the assistance of one of the seamen, I carried it to my tent, to make a coloured drawing.

"The wings of this bird, which I measured very exactly, were twelve feet three inches (English) from tip to tip. The great feathers, that were of a beautiful shining black, were two feet four inches long. The thickness of the beak was proportionable to the rest of the body; the length about four inches, the point hooked downwards, and white at its extremity; and the other part was of a jet black. A short down, of a brown colour, covered the head; the eyes were black, and surrounded with a circle of reddish brown. The feathers on the breast, neck, and wings, were of a light brown; those on the back were rather darker. Its thighs were covered with brown feathers to the knee. The thigh bone was ten inches long; the leg five inches; the toes were three before, and one behind: that behind was an inch and a half, and the claw with which it was armed was black, and three quarters of an inch. The other claws were in the same proportion; and the legs were covered with black scales, as also the toes; but in these the scales were larger.

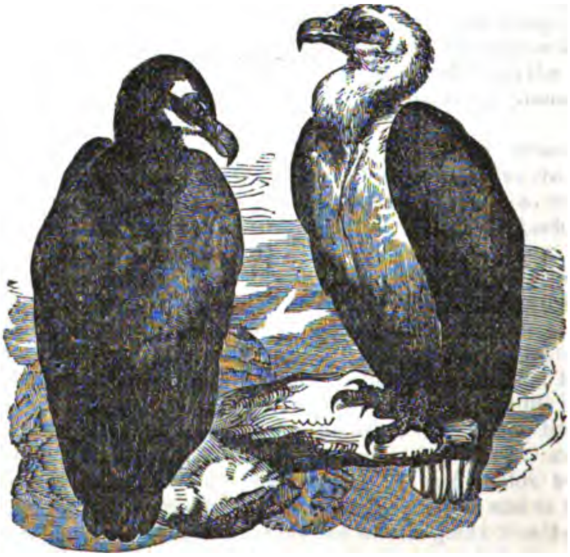
"These birds usually keep in the mountains, where they find their prey. They never descend to the sea-shore but in the rainy season; for, as they are very sensible of cold, they go there for greater warmth. Though these mountains are situated in the torrid zone, the cold is often very severe; for a great part of the year they are covered with snow, but particularly in winter.

"The little nourishment which these birds find on the sea-coast, except when the tempests drive in some great fish, obliges the condor to continue there but a short time. They usually come to the coast at the approach of evening; stay there all night, and fly back in the morning."

It is doubted whether this animal be proper to America only, or whether it may not have been described by the naturalists of other countries. It is supposed that the great bird called the Rock, described by Arabian writers, and so much exaggerated by fable, is but a species of the condor. The great bird of Tarnassar, in the East-Indies, that is larger than the eagle, as well as the vulture of Senegal, that carries off children, are probably no other than the bird we have been describing. Russia, Lapland, and even Switzerland and Germany, are said to have known this animal. A bird of this kind was shot in France, that weighed eighteen pounds, and was said to be eighteen feet across the wings; however, one of the quills was described only as being larger than that of a swan; so that probably the breadth of the wings may have been exaggerated, since a bird so large would have the quills more than twice as big as those of a swan. However



Golden Vulture, p. 67.



Eagle of Brazil, p. 64.

To face p. 67, vol. iii.

this be, we are not to regret that it is scarcely ever seen in Europe, as it appears to be one of the most formidable enemies of mankind In the deserts of Pachomac, where it is chiefly seen, men seldom venture to travel. Those wild regions are very sufficient of themselves to inspire a secret horror: broken precipices—prowling panthers—forests only vocal with the hissing of serpents—and mountains rendered still more terrible by the condor, the only bird that ventures to make its residence in those deserted situations.

CHAPTER IV.

OF THE VULTURE AND ITS AFFINITIES.

The first rank in the description of birds, has been given to the eagle; not because it is stronger and larger than the vulture, but because it is more generous and bold. The eagle, unless pressed by famine, will not stoop to carrion; and never devours but what he has earned by his own pursuit. The vulture, on the contrary, is indelicately voracious; and seldom attacks living animals, when it can be supplied with the dead. The eagle meets, and singly opposes his enemy; the vulture, if he expects resistance, calls in the aid of its kind, and basely overpowers its prey by a cowardly combination. Putrefaction and stench, instead of deterring, only serve to allure them. The vulture seems among birds, what the jackal and hyæna are among quadrupeds, who prey upon carcasses, and root up the dead.

Vultures may be easily distinguished from all those of the eagle kind, by the nakedness of their heads and necks, which are without feathers, and only covered with a very slight down, or a few scattered hairs. Their eyes are more prominent; those of the eagle's being buried more in the socket. Their claws are shorter, and less hooked. The inside of the wing is covered with a thick down, which is different in them from all other birds of prey. Their attitude is not so upright as that of the eagle; and their flight more difficult and heavy.

In this tribe we may range the golden, the ash-coloured, and the brown vulture, which are inhabitants of Europe; the spotted and the black vulture of Egypt; the bearded vulture; the Brazilian vulture, and the king of the vultures of South America. They all agree in their nature, being equally indolent, yet rapacious and unclean.

The Golden Vulture seems to be the foremost of the kind, and is in many things like the golden eagle, but larger in every proportion. From the end of the beak to that of the tail, it is four feet and a half; and to the claws' end, forty-five inches. The length of the upper mandible is almost seven inches; and the tail twenty-seven in length. The lower part of the neck, breast, and belly, are of a red colour;

but on the tail it is more faint, and deeper near the head. The feathers are black on the back; and on the wings and tail, of a yellowish brown Others of the kind differ from this colour and dimensions; but they are all strongly marked by their naked heads, and beak straight in the beginning, but hooking at the point.

They are still more strongly marked by their nature, which, as has been observed, is cruel, unclean, and indolent. Their sense of smelling, however, is amazingly great; and nature, for this purpose, has given them two large apertures or nostrils without, and an extensive olfactory membrane within. Their intestines are formed differently from those of the eagle kind; for they partake more of the formation of such birds as live upon grain. They have both a crop and a stomach, which may be regarded as a kind of gizzard, from the extreme thickness of the muscles of which it is composed. In fact, they seem adapted inwardly, not only for being carnivorous, but to eat corn, or whatsoever of that kind comes in their way.

This bird, which is common in many parts of Europe, and but too well known on the western continent, is totally unknown in England. In Egypt, Arabia, and many other kingdoms of Africa and Asia, vultures are found in great abundance. The inside down of their wing is converted into a very warm and comfortable kind of fur, and is commonly sold in the Asiatic markets.

Indeed, in Egypt, this bird seems to be of singular service. There are great flocks of them in the neighbourhood of Grand Cairo, which no person is permitted to destroy. The service they render the inhabitants, is the devouring all the carrion and filth of that great city, which might otherwise tend to corrupt and putrefy the air. They are commonly seen in company with the wild dogs of the country, tearing a carcass very deliberately together. This odd association produces no quarrels; the birds and quadrupeds seem to live amicably, and nothing but harmony subsists between them. The wonder is still the greater, as both are extremely rapacious, and both lean and bony to a very great degree; probably having no great plenty even of the wretched food on which they subsist.

In America they lead a life somewhat similar. Wherever the hunters, who there only pursue beasts for their skins, are found to go, these birds are seen to pursue them. They still keep hovering at a little distance, and when they see the beast flead and abandoned, they call out to each other, pour down upon the carcass, and in an instant, pick its bones as bare and clean as if they had been scraped by a knife

At the Cape of Good Hope, in Africa, they seem to discover a still greater share of dexterity in their methods of carving. "I have," says Kolben, "been often a spectator of the manner in which they have anatomized a dead body: I say anatomized, for no artist in the world could have done it more cleanly. They have a wonderful method of separating the flesh from the bones, and yet leaving the skin quite entire. Upon coming near the carcass, one would not suppose it thus deprived of its internal substance, till he began to examine it more closely; he then finds it, literally speaking, nothing but skin and bone. Their manner of performing the operation is this: they first make an opening in the belly of the animal, from whence they pluck out, and greedily devour the entrails: then entering into the hollow which they have made, they separate the flesh from the bones, without ever touching the skin. It often happens that an ox returning home alone to its stall from the plough, lies down by the way. it is then, if the vultures perceive it, that they fall with fury down, and inevitably devour the unfortunate animal. They sometimes attempt them grazing in the fields; and then, to the number of a hundred, or more, make their attack all at once and together."

"They are attracted by carrion," says Catesby, "from a very great distance. It is pleasant to behold them, when they are thus eating, and disputing for their prey. An eagle generally presides at these entertainments, and makes them all keep their distance till he has done. They then fall too with an excellent appetite; and their sense of smelling is so exquisite, that the instant a carcass drops, we may see the vultures floating in the air from all quarters, and come sousing on their prey." It is supposed by some, that they eat nothing that has life; but this is only when they are not able; for when they can come at lambs, they show no mercy; and serpents are their ordinary food. The manner of those birds is to perch themselves, several together, on the old pine and cypress-trees; where they continue all the morning, for several hours, with their wings unfolded; nor are they fearful of danger, but suffer people to approach them very near, particularly when they are eating.

The sloth, the filth, and the voraciousness of these birds, almost exceed credibility. In the Brasils, where they are found in great abundance, when they light upon a carcas which they have liberty to tear at their ease, they so gorge themselves that they are unable to fly; but keep hopping along when they are pursued. At all times, they are a bird of slow flight, and unable readily to raise themselves from the ground; but when they have over-fed, they are then utterly helpless; but they soon get rid of their burden; for they have a method of vomiting up what they have eaten, and then they fly off with greater facility.

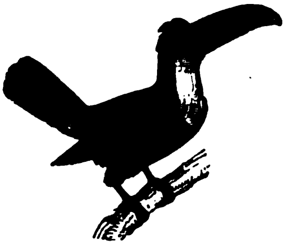
It is pleasant, however, to be a spectator of the hostilities between animals that are thus hateful or noxious. Of all creatures, the two most at enmity, are the vulture of Brasil, and the crocodile. The female of this terrible amphibious creature, which in the rivers of that part of the world grows to the size of twenty-seven feet, lays its eggs, to the number of one or two hundred, in the sands, on the side of the river, where they are hatched by the heat of the climate. For this purpose, she takes every precaution to hide from all other animals the place where she deposits her burden: in the mean time, a number of vultures, or galinassos, as the Spaniards call them, sit silent and unseen, in the branches of some neighbouring forest, and view the crocodile's operations, with the pleasing expectation of succeeding plunder They patiently wait till the crocodile has laid the whole number of her eggs, till she has covered them carefully under the sand. and until she is retired from them to a convenient distance Then, all together, encouraging each other with cries, they pour down upon the nest, hook up the sand in a moment, lay the eggs bare, and devour the whole brood without remorse. Wretched as is the flesh of these animals, yet men, perhaps when pressed by hunger, have been tempted to taste it. Nothing can be more lean, stringy, nauseous, and unsavoury. It is in vain that, when killed, the rump has been cut off; in vain the body has been washed, and spices used to overpower its prevailing odour; it still smells and tastes of the carrion by which it was nourished, and sends forth a stench that is insupportable.

These birds, at least those of Europe, usually lay two eggs at a time, and produce but once a year. They make their nests in inaccessible cliffs, and in places so remote, that it is rare to find them Those in our part of the world chiefly reside in the places where they breed, and seldom come down into the plains, except when the snow and ice, in their native retreats, has banished all living animals but themselves: they then come from their heights, and brave the perils they must encounter in a more cultivated region. As carrion is not found, at those seasons, in sufficient quantity, or sufficiently remote from man to sustain them, they prey upon rabbits, hares, serpents, and whatever small game they can overtake or overpower.

Such are the manners of this bird in general; but there is one of the kind, called the King of the Vultures, which, from its extraordinary figure, deserves a separate description. This bird is a native of America, and not of the East Indies, as those who make a trade of showing birds would induce us to believe. This bird is larger than a turkey-cock: but is chiefly remarkable for the odd formation of the skin of the head and neck, which is bare. This skin arises from the base of the bill, and is of an orange colour; from whence it stretches on each side of the head; from thence it proceeds, like an indented comb, and falls on either side, according to the motion of the head. The eyes are surrounded by a red skin, of a scarlet colour; and the iris has the colour and lustre of pearl. The head and neck are without feathers, covered with a flesh-coloured skin on the upper part, a fine scarlet behind the head, and a duskier coloured skin before, farther down, behind the head, arises a little tuft of black down, from whence issues and extends beneath the throat, on each side, a wrinkled skin, of a brownish colour, mixed with blue, and reddish behind: below, upon the naked part of the neck, is a collar, formed by soft, longish feathers, of a deep ash-colour, which surround the neck, and cover the breast before. Into this collar the bird sometimes withdraws its whole neck, and sometimes a part of its head; so that it looks as if it had withdrawn the neck into the body. Those marks are sufficient to distinguish this bird from all others of the vulture kind; and it cannot be doubted, but that it is the most beautiful of al this deformed family: however, neither its habits nor instinct vary from the rest of the tribe; being like them a slow, cowardly bird, living chiefly upon rats, lizards, and serpents; and upon carrion or excrement, when it happens to be in the way. The flesh is so bad, that even savages themselves cannot abide it.

Butcher Bird, p. 76.

Sparrow Hawk, p. 72.



Toucan, p. 116.

Kite, p. 72.

Secretary, p. 67.

Buzzard, p. 75.

To face p. 71 vol. iii.

CHAPTER V.

OF THE FALCON KIND AND ITS AFFINITIES.

Every creature becomes more important in the history of nature, in proportion as it is connected with man. In this view, the smallest vegetable, or the most seemingly contemptible insect, is a subject more deserving attention than the most flourishing tree, or the most beautiful of the feathered creation. In this view, the falcon is a more important animal than the eagle or the vulture; and, though so very diminutive in the comparison, is, notwithstanding, from its connexion with our pleasures, a much more interesting object of curiosity.

The amusement of hawking, indeed, is now pretty much given over in this kingdom; for as every country refines, as its inclosures become higher and closer, those rural sports must consequently decline, in which the game is to be pursued over a long extent of country; and where, while every thing retards the pursuer below, nothing can stop the object of his pursuit above.

Falconry, that is now so much disused among us, was the principal amusement of our ancestors. A person of rank scarce stirred out without his hawk on his hand, which in old paintings is the criterion of nobility. Harold, afterwards king of England, when he went on a most important embassy into Normandy, is drawn in an old bas-relief, as embarking with a bird on his fist, and a dog under his arm. In those days, it was thought sufficient for noblemen's sons to wind the horn and to carry their hawk fair, and leave study and learning to the children of meaner people. Indeed, this diversion was in such high esteem among the great all over Europe, that Frederick, one of the emperors of Germany, thought it not beneath him to write a treatise upon hawking.

The expense which attended this sport was very great: among the old Welch princes, the king's falconer was the fourth officer in the state; but, notwithstanding all his honours, he was forbid to take more than three draughts of beer from his horn, lest he should get drunk and neglect his duty. In the reign of James I. Sir Thomas Monson is said to have given a thousand pounds for a cast of hawks; and such was their value in general, that it was made felony in the reign of Edward III. to steal a hawk. To take its eggs, even in a person's own ground, was punishable with imprisonment for a year and a day, together with a fine at the king's pleasure. In the reign of Elizabeth, the imprisonment was reduced to three months; but the offender was to lie in prison till he got security for his good behaviour for seven years farther. In the earlier times, the art of gunning was but little practised, and the hawk was then valuable, not only for its affording division, but for its procuring delicacies for the table that could seldom be obtained any other way.

Of many of the ancient falcons used for this purpose, we at this time know only the names, as the exact species are so ill described, that one may be very easily mistaken for another. Of those in use, at present, both here and in other countries, are the gyr-falcon, the falcon, the lanner, the sacre, the hobby, the kestril, and the merlin These are called the long-winged hawks, to distinguish them from the goss-hawk, the sparrow-hawk, the kite, and the bustard, that are of a shorter wing, and either too slow, too cowardly, too indolent, or too obstinate, to be serviceable in contributing to the pleasures of the field.

The generous tribe of hawks, as was said, are distinguished from the rest by the peculiar length of their wings, which reach nearly as low as the tail. In these, the first quill of the wing is nearly as long as the second; it terminates in a point, which begins to diminish from about an inch of its extremity. This sufficiently distinguishes the generous breed from that of the baser race of kites, sparrow-hawks, and buzzards, in whom the tail is longer than the wings, and the first feather of the wing is rounded at the extremity. They differ also in the latter having the fourth feather of the wing the longest; in the generous race it is always the second.

The generous race, which have been taken into the service of man, are endowed with natural powers that the other kinds are not possessed of. From the length of their wings, they are swifter to pursue their game; from a confidence in this swiftness, they are bolder to attack it; and, from an innate generosity, they have an attachment to their feeder, and consequently a docility which the baser birds are strangers to.

The gyr-falcon leads in this bold train. He exceeds all other falcons in the largeness of his size, for he approaches nearly to the magnitude of the eagle. The top of the head is flat, and of an ash-colour, with a strong, thick, short and blue beak. The feathers of the back and wings are marked with blue spots, in the shape of a heart; he is a courageous and fierce bird, nor fears even the eagle himself; but he chiefly flies at the stork, the heron, and the crane. He is mostly found in the colder regions of the north, but loses neither his strength nor his courage when brought into the milder climates.

The falcon, properly so called, is the second in magnitude and fame. There are some varieties in this bird; there seem to be only two that claim distinction—the falcon-gentil and the peregrine-falcon; both are much less than the gyr, and somewhat about the size of a raven. They differ but slightly, and perhaps only from the different states they were in when brought into captivity. Those differences are easier known by experience than taught by description. The falcon-gentil moults in March, and often sooner: the peregrine-falcon does not moult till the middle of August. The peregrine is stronger in the shoulder, has a larger eye, and yet more sunk in the head; his beak is stronger, his legs longer, and the toes better divided.

Next in size to these is the lanner, a bird now very little known in Europe; then follows the sacre, the legs of which are of a bluish colour, and serve to distinguish that bird; to them succeeds the hobby, used for smaller game, for daring larks, and stooping at quails. The kestril was trained for the same purposes; and lastly the merlin, which though the smallest of all the hawk or falcon kind, and not much larger than a thrush, yet displays a degree of courage that renders him formidable even to birds ten times the size. He has often been known to kill a partridge or a quail at a single pounce from above.

Some of the other species of sluggish birds were now and then trained to this sport, but it was when no better could be obtained; but these just described were only considered as birds of the nobler races. Their courage in general was such, that no bird, not very much above their own size could terrify them; their swiftness so great, that scarce any bird could escape them; and their docility so remarkable, that they obeyed not only the commands, but the signs of their master. They remained quietly perched upon his hand till their game was flushed, or else kept hovering round his head, without ever leaving him but when he gave permission. The common falcon is a bird of such spirit, that, like a conqueror in a country, he keeps all birds in awe and in subjection to his prowess. When he is seen flying wild, as I often had an opportunity of observing, the birds of every kind, that seemed entirely to disregard the kite or the sparrow-hawk, fly with screams at his most distant appearance. Long before I could see the falcon, I have seen them with the utmost signs of terror endeavouring to avoid him; and, like the peasants of a country before a victorious army, every one of them attempting to shift for himself. Even the young falcons, though their spirits be depressed by captivity, will, when brought out into the field, venture to fly at barnacles and wild geese, till, being soundly brushed and beaten by those strong birds, they learn their error, and desist from meddling with such unwieldy game for the future.

To train up the hawk to this kind of obedience, so as to hunt for his master, and bring him the game he shall kill, requires no small degree of skill and assiduity. Numberless treatises have been written upon this subject, which are now, with the sport itself, almost utterly forgotten: indeed, except to a few, they seem utterly unintelligible; for the falconers had a language peculiar to themselves, in which they conversed and wrote, and took a kind of professional pride in using no other. A modern reader, I suppose, would be little edified by one of the instructions, for instance, which we find in Willoughby, when he bids us *draw our falcon out of the mew twenty days before we enseam her. If she truss and carry, the remedy is, cosse her talons, her powse, and petty single.*

But, as it certainly makes a part of natural history to show how much the nature of birds can be wrought upon by harsh or kind treatment, I will just take leave to give a short account of the manner of training a hawk, divested of those cant words with which men of art have thought proper to obscure their profession.

In order to train up a falcon, the master begins by clapping on straps upon his legs, which are called *jesses*, to which there is fastened a ring with the owner's name, by which, in case he should be lost, the finder may know where to bring him back. To these also are added little bells which serve to mark the place where he is, if lost in the chase. He is always carried on the fist, and is obliged to keep without sleeping. If he be stubborn, and attempt to bite, his head is plunged into water. Thus, by hunger, watching, and fatigue, he is constrained to submit to having his head covered by a hood, or cowl, which covers his eyes. This troublesome employment continues often for three days and nights without ceasing. It rarely happens but at the end of this his necessities, and the privation of light, make him lose all idea of liberty, and bring down his natural wildness. His master judges of his being tamed when he permits his head to be covered without resistance, and when uncovered, he seizes the meat before him contentedly. The repetition of these lessons by degrees insures success. His wants being the chief principle of his dependence, it is endeavoured to increase his appetite by giving him little balls of flannel, which he greedily swallows. Having thus excited the appetite, care is taken to satisfy it; and thus gratitude attaches the bird to the man who but just before had been his tormentor.

When the first lessons have succeeded, and the bird shows signs of docility, he is carried out upon some green, the head is uncovered, and, by flattering him with food at different times, he is taught to jump on the fist, and to continue there. When confirmed in this habit, it is then thought time to make him acquainted with the lure. This lure is only a thing stuffed like the bird the falcon is designed to pursue, such as a heron, a pigeon, or a quail; and on this lure they always take care to give him his food. It is quite necessary that the bird should not only be acquainted with this, but fond of it, and delicate in his food when shown it. When the falcon has flown upon this, and tasted the first morsel, some falconers then take it away; but by this there is a danger of daunting the bird; and the surest method is, when he flies to seize it, to let him feed at large, and this serves as a recompense for his docility. The use of this lure is to flatter him back when he has flown in the air, which it sometimes fails to do; and it is always requisite to assist it by the voice and the signs of the master. When these lessons have been long repeated, it is then necessary to study the character of the bird; to speak frequently to him if he be inattentive to the voice; to stint in his food such as do not come kindly or readily to the lure; to keep waking him if he be not sufficiently familiar; and to cover him frequently with the hood if he fears darkness. When the familiarity and the docility of the bird are sufficiently confirmed on the green, he is then carried into the open fields, but still kept fast by a string, which is about twenty yards long. He is then uncovered as before; and the falconer, calling him at some paces distance, shows him the lure. When he flies upon it he is permitted to take a large morsel of the food which is tied to it. The next day the lure is shown him at a greater distance, till he comes at last to fly to it at the utmost length of his string. He is then to be shown the game itself alive, but disabled or tame, which he is designed to pursue. After having seized this several times with his string, he is then left entirely at liberty, and carried into the field for the purposes of pursuing that which is wild. At that he flies with avidity; and when he has seized it or killed it, he is brought back by the voice and the lure

By this method of instruction, a hawk may be taught to fly at any game whatsoever; but falconers have chiefly confined their pursuit only to such animals as yield them profit by the capture, or pleasure in the pursuit. The hare, the partridge, and the quail, repay the trouble of taking them; but the most delightful sport is the falcon's pursuit of he heron, the kite, or the wood-lark. Instead of flying directly forward, as some other birds do, these, when they see themselves threatened by the approach of the hawk, immediately take to the skies.—They fly almost perpendicularly upward, while their ardent pursuer keeps pace with their flight, and tries to rise above them. Thus both diminish by degrees from the gazing spectator below, till they are quite lost in the clouds; but they are soon seen descending, struggling together, and using every effort on both sides; the one of rapacious insult, the other of desperate defence. The unequal combat is soon at an end; the falcon comes off victorious, and the other killed, or disabled, is made a prey either to the bird or the sportsman.

As for other birds, they are not so much pursued, as they generally fly straight forward, by which the sportsman loses sight of the chase, and what is still worse, runs a chance of losing his falcon also. The pursuit of the lark by a couple of merlins is considered, to him only who regards the sagacity of the chase, as one of the most delightful spectacles this exercise can afford. The amusement is to see one of the merlins climbing to get the ascendant of the lark, while the other, lying low for the best advantage, waits the success of its companion's efforts: thus while the one stoops to strike its prey, the other seizes it at its coming down.

Such are the natural and acquired habits of these birds, which of all others have the greatest strength and courage relative to their size. While the kite or the gos-hawk approach their prey side-ways, these dart perpendicularly, in their wild state, upon their game, and devour it on the spot, or carry it off, if not too large for their power of flying They are sometimes seen descending perpendicularly from the clouds, from an amazing height, and darting down on their prey with inevitable swiftness and destruction.

The more ignoble race of birds make up by cunning and assiduity what these claim by force and celerity. Being less courageous, they are more patient; and having less swiftness, they are better skilled at taking their prey by surprise. The kite, that may be distinguished from all the rest of this tribe by his forky tail and his slow floating motion, seems almost for ever upon the wing. He appears to rest himself upon the bosom of the air, and not to make the smallest effort in flying. He lives only upon accidental carnage, as almost every bird in the air is able to make good its retreat against him. He may be therefore considered as an insidious thief, who only prowls about, and, when he finds a small bird wounded, or a young chicken strayed too far from the mother, instantly seizes the hour of calamity, and, like a famished glutton, is sure to show no mercy. His hunger, indeed, often urges him to acts of seeming desperation. I have seen one of them fly round and round for a while to mark a clutch of chickens, and then on a sudden dart like lightning upon the unresisting little animal, and carry it off, the hen in vain crying out, and the boys hooting and casting stones to scare it from its plunder. For this reason, of a birds, the kite is the good housewife's greatest tormentor and aversion.

Of all obscene birds, the kite is the best known; but the buzzard among us *is* the most plenty. He is a sluggish inactive bird, and often remains perched whole days together upon the same bough. He is rather an assassin than a pursuer; and lives more upon frogs, mice, and insects, which he can easily seize, than upon birds which he is obliged to follow. He lives in summer by robbing the nests of other birds, and sucking their eggs, and more resembles the owl kind in his countenance than any other rapacious bird of day. His figure implies the stupidity of his disposition; and so little is he capable of instruction from man, that it is common to a proverb to call one who cannot be taught, or continues obstinately ignorant, *a buzzard.* The honey-buzzard, the moor-buzzard, and the hen-harrier, are all of this stupid tribe, and differ chiefly in their size, growing less in the order I have named them. The gos-hawk and sparrow-hawk are what Mr. Willoughby calls short-winged birds, and consequently unfit for training, however injurious they may be to the pigeon-house or the sportsman. They have been indeed taught to fly at game; but little is to be obtained from their efforts, being difficult of instruction and capricious in their obedience. It has been lately asserted, however, by one whose authority is respectable, that the sparrow-hawk is the boldest and the best of all others for the pleasure of the chase.

CHAPTER VI

THE BUTCHER-BIRD.

BEFORE I conclude this short history of rapacious birds that prey by day, I must take leave to describe a tribe of smaller birds, that seem from their size rather to be classed with the harmless order of the sparrow-kind; but that from their crooked beak, courage and appetites for slaughter, certainly deserve a place here. The lesser butcher-bird is not much above the size of a lark; that of the smallest species is not so big as a sparrow; yet, diminutive as these little animals are, they make themselves formidable to birds of four times their dimensions.

The greater butcher-bird is about as large as a thrush; its bill is black, an inch long, and hooked at the end. This mark, together with its carnivorous appetites, ranks it among the rapacious birds; at the same time that its legs and feet, which are slender, and its toes, formed somewhat differently from the former, would seem to make it the shade between such birds as live wholly upon flesh, and such as live chiefly upon insects and grain.

Indeed, its habits seem entirely to correspond with its conformation, as it is found to live as well upon flesh as upon insects, and thus to partake in some measure of a double nature However, its appetite for flesh is the most prevalent, and it never takes up with the former when it can obtain the latter. This bird, therefore, leads a life of continual combat and opposition. As from its size it does not much terrify the smaller birds of the forest, so it very frequently meets birds willing to try its strength, and it never declines the engagement.

It is wonderful to see with what intrepidity this little creature goes to war with the pie, the crow, and the kestril, all above four times bigger than itself, and that sometimes prey upon flesh in the same manner. It not only fights upon the defensive, but often comes to attack, and always with advantage, particularly when the male and female unite to protect their young, and to drive away the more powerful birds of rapine. At that season they do not wait the approach of their invader; it is sufficient that they see him preparing for the assault at a distance. It is then that they sally forth with loud cries, wound him on every side, and drive him off with such fury, that he seldom ventures to return to the charge. In these kinds of disputes they generally come off with the victory; though it sometimes happens that they fall to the ground with the bird they have so fiercely fixed upon, and the combat ends with the destruction of the assailant as well as the defender.

For this reason the most redoubtable birds of prey respect them; while the kite, the buzzard, and the crow, seem rather to fear than seek the engagement. Nothing in Nature better displays the respect paid to the claims of courage, than to see this little bird, apparently so contemptible, fly in company with the lanner, the falcon, and all the tyrants of the air, without fearing their power, or avoiding their resentment.

As for small birds, they are its usual food. It seizes them by the throat, and strangles them in an instant. When it has thus killed the bird or insect, it is asserted by the best authority, that it fixes them upon some neighbouring thorn, and, when thus spitted, pulls them to pieces with its bill. It is supposed that as Nature has not given this bird strength sufficient to tear its prey to pieces with its feet, as the hawks do, it is obliged to have recourse to this extraordinary expedient.

During summer, such of them as constantly reside here, (for the smaller red butcher-bird migrates,) remain among the mountainous parts of the country; but in winter they descend into the plains, and nearer human habitations. The larger kind make their nests on the highest trees, while the lesser build in bushes in the fields and hedgerows. They both lay about six eggs, of a white colour, but encircled at the bigger end with a ring of brownish red. The nest on the outside is composed of white moss, interwoven with long grass; within it is well lined with wool, and is usually fixed among the forking branches of a tree. The female feeds her young with caterpillars and other insects while very young, but soon after accustoms them to flesh, which the male procures with surprising industry. Their nature also is very different from other birds of prey in their parental care; for, so far from driving out their young from the nest to shift for themselves, they keep them with care; and even when adult, they do not forsake them, but the whole brood live in one family together. Each family lives apart, and is generally composed of the male, female, an five or six young ones: these all maintain peace and subordination among each other, and hunt in concert. Upon the returning season of courtship this union is at an end, the family parts for ever, each to establish a little household of its own. It is easy to distinguish these birds at a distance, not only from their going in companies, but also from their manner of flying, which is always up and down, seldom direct or side-ways.

Of these birds there are three or four different kinds; but the greater ash-coloured butcher-bird is the least known among us. The red-backed butcher-bird migrates in autumn, and does not return till spring, the wood-chat resembles the former, except in the colour of its back, which is brown, and not red as in the other. There is still another, less than either of the former, found in the marshes near London. This too, is a bird of prey, although not much bigger than a titmouse; an evident proof that an animal's courage or rapacity does not depend upon its size. Of foreign birds of this kind, there are several; but as we know little of their manner of living, we will not, instead of history, substitute mere description. In fact, the colours of a bird, which is all we know of them, would afford a reader but small entertaiment in the enumeration. Nothing can be more easy than to fill volumes with the different shades of a bird's plumage; but these accounts are written with more pleasure than they are read; and a single glance of a good plate or a picture imprints a juster idea than a volume could convey.

CHAPTER VII.

OF RAPACIOUS BIRDS OF THE OWL KIND THAT PREY BY NIGHT.

HITHERTO we have been describing a tribe of animals who, though plunderers among their fellows of the air, yet wage war boldly in the face of day. We now come to a race equally cruel and rapacious; but who add to their savage disposition the further reproach of treachery, and carry on all their depredations by night.

All birds of the owl kind may be considered as nocturnal robbers, who, unfitted for taking their prey while it is light, surprise it at those hours of rest when the tribes of Nature are in the least expectation of an enemy. Thus there seems no link in Nature's chain broken; no where a dead inactive repose; but every place, every season, every hour of the day and night, is bustling with life, and furnishing instances of industry, self-defence, and invasion.

All birds of the owl kind have one common mark by which they are distinguished from others; their eyes are formed for seeing better in the dusk than in the broad glare of sun-shine. As in the eyes of the tigers and cats, that are formed for a life of nocturnal depredation, there is a quality in the retina that takes in the rays of light so copiously as to permit their seeing in places almost quite dark; so in

Quail, p. 105.

California Quail, p. 105.

Barn Owl, p. 79.

Partridge, p. 163.

Great Horned Owl, p. 79.

Brown Horn Owl, p. 79.

To face p. 78, vol. iii.

these birds there is the same conformation of that organ, and though like us, they cannot see in a total exclusion of light, yet they are sufficiently quick-sighted at times when we remain in total obscurity. In the eyes of all animals, Nature hath made a complete provision, either to shut out too much light, or to admit a sufficiency, by the contraction and dilatation of the pupil. In these birds the pupil is capable of opening very wide, or shutting very close: by contracting the pupil, the brighter light of the day, which would act too powerfully upon the sensibility of the retina, is excluded; by dilating the pupil, the animal takes in the more faint rays of the night, and thereby is enabled to spy its prey, and catch it with greater facility in the dark. Beside this, there is an irradiation on the back of the eye, and the very iris itself has a faculty of reflecting the rays of light, so as to assist vision in the gloomy places where these birds are found to frequent.

But though owls are dazzled by too bright a day-light, yet they do not see best in the darkest nights, as some have been apt to imagine. It is in the dusk of the evening, or the gray of the morning, that they are best fitted for seeing, at those seasons when there is neither too much light, nor too little. It is then that they issue from their retreats to hunt or to surprise their prey, which is usually attended with great success: it is then that they find all other birds asleep, or preparing for repose, and they have only to seize the most unguarded.

The nights when the moon shines are the times of their most successful plunder; for when it is wholly dark, they are less qualified for seeing and pursuing their prey: except, therefore, by moonlight, they contract the hours of their chace: and if they come out at the approach of dusk in the evening, they return before it is totally dark, and then rise by twilight the next morning to pursue their game, and to return in like manner, before the broad day-light begins to dazzle them with its splendour.

Yet the faculty of seeing in the night, or of being entirely dazzled by day, is not alike in every species of these nocturnal birds: some see by night better than others; and some are so little dazzled by daylight, that they perceive their enemies and avoid them. The common White or Barn Owl, for instance, sees with such exquisite acuteness in the dark, that though the barn has been shut at night, and the light thus totally excluded, yet it perceives the smallest mouse that peeps from its hole: on the contrary, the Brown Horn, Owl is often seen to prowl along the hedges by day, like the sparrow-hawk; and sometimes with good success.

All birds of the owl kind may be divided into two sorts; those that have horns, and those without. These horns are nothing more than two or three feathers that stand upon each side of the head over the ear, and give this animal a kind of horned appearance. Of the horned kind is, the Great Horned Owl, which at first view appears as large as an eagle. When he comes to be observed more closely, however, he will be found much less. His legs, body, wings, and tail are shorter: his head much larger and thicker; his horns are composed of feathers that rise above two inches and a half high, and which he can erect or depress at pleasure: his eyes are large and transparent, encircled with an orange-coloured iris: his ears are large and deep, and it would appear that no animal was possessed with a more exquisite sense of hearing: his plumage is of a reddish brown, marked on the back with black and yellow spots, and yellow only upon the belly.

Next to this is the Common Horned Owl, of a much smaller size than the former, and with horns much shorter. As the great owl was five feet from the tip of one wing to the other, this is but three. The horns are but about an inch long, and consist of six feathers, variegated with black and yellow.

There is still a smaller kind of the horned owl, which is not much larger than a black-bird, and whose horns are remarkably short, being composed but of one feather, and that not above half an inch high.

To these succeeds the tribe without horns. The Howlet, which is the largest of this kind, with dusky plumes and black eyes; the Screech-Owl, of a smaller size, with blue eyes, and plumage of an iron grey; the White Owl, about as large as the former, with yellow eyes and whitish plumage; the Great Brown Owl, less than the former, with brown plumage and a brown beak; and lastly, the Little Brown Owl, with yellowish coloured eyes, and an orange-coloured bill. To this catalogue might be added others of foreign denominations, which differ but little from our own, if we except the Harfang, or Great Hudson's Bay Owl of Edwards, which is the largest of all the nocturnal tribe, and as white as the snows of the country of which he is a native.

All this tribe of animals, however they may differ in their size and plumage, agree in their general characteristics of preying by night, and having their eyes formed for nocturnal vision. Their bodies are strong and muscular; their feet and claws made for tearing their prey; and their stomachs for digesting it. It must be remarked, however, that the digestion of all birds that live upon mice, lizards, or such like food, is not very perfect; for though they swallow them whole, yet they are always seen some time after to disgorge the skin and bones, rolled up in a pellet, as being indigestible.

In proportion as each of these animals bears the day-light best, he sets forward earlier in the evening in pursuit of his prey. The great horned owl is the foremost in leaving his retreat, and ventures into the woods and thickets very soon in the evening. The horned and the brown owl are later in their excursions; but the barn-owl seems to see best in profound darkness, and seldom leaves his hiding-place till midnight.

As they are incapable of supporting the light of the day, or at least of then seeing and readily avoiding their danger, they keep all this time concealed in some obscure retreat, suited to their gloomy appetites, and there continue in solitude and silence. The cavern of a rock, the darkest part of a hollow tree, the battlements of a ruined and unfrequented castle, some obscure hole in a farmer's out-house, are the places where they are usually found: if they be seen out of these retreats in the day-time, they may be considered as having lost their way: as having by some accident been thrown into the midst of their enemies, and surrounded with danger.

Having spent the day in their retreat, at the approach of evening they sally forth, and skim rapidly up and down along the hedges. The barn owl, indeed, who lives chiefly upon mice, is contented to be more stationary: he takes his residence upon some shock of corn, or the point of some old house, and there watches in the dark, with the utmost perspicacity and perseverance.

Nor are these birds by any means silent; they all have a hideous note, which, while pursuing their prey, is seldom heard, but may be considered rather as a call to courtship. There is something always terrifying in this call, which is often heard in the silence of midnight, and breaks the general pause with a horrid variation. It is different in all; but in each it is alarming and disagreeable. Father Kircher, who has set the voices of birds to music, has given all the tones of the owl note, which makes a most tremendous melody. Indeed, the prejudices of mankind are united with their sensations to make the cry of the owl disagreeable. The screech-owl's voice was always considered among the people as a presage of some sad calamity that was soon to ensue.

They seldom, however, are heard while they are preying, that important pursuit is always attended with silence, as it is by no means their intention to disturb or forewarn those little animals they wish to surprise. When their pursuit has been successful, they soon return to their solitude, or to their young, if that be the season. If, however, they find but little game, they continue their quest still longer; and it sometimes happens that, obeying the dictates of appetite rather than of prudence, they pursue so long that broad day breaks in upon them, and leaves them dazzled, bewildered, and at a distance from home.

In this distress they are obliged to take shelter in the first tree or hedge that offers, there to continue concealed all day, till the returning darkness once more supplies them with a better plan of the country. But it too often happens that with all their precaution to conceal themselves, they are spied out by the other birds of the place, and are sure to receive no mercy. The blackbird, the thrush, the jay, the bunting, and the red-breast, all come in file, and employ their little arts of insult and abuse. The smallest, the feeblest, and the most contemptible of this unfortunate bird's enemies are then the foremost to injure and torment him. They increase their cries and turbulence round him, flap him with their wings, and are ready to show their courage to be great, as they are sensible that their danger is but small. The unfortunate owl, not knowing where to attack, or where to fly, patiently sits and suffers all their insults. Astonished and dizzy, he only replies to their mockeries by awkward and ridiculous gestures, by turning his head, and rolling his eyes with an air of stupidity. It is enough that an owl appears by day to set the whole grove into a kind of uproar. Either the aversion all the small birds have to this animal, or the consciousness of their own security, makes them pursue him without ceasing, while they encourage each other by their mutual cries to lend assistance in this laudable undertaking.

It sometimes happens, however, that the little birds pursue their insults with the same imprudent zeal with which the owl himself had pursued his depredations. They hunt him the whole day until evening returns, which restoring him his faculties of sight once more, he makes the foremost of his pursuers pay dear for their former sport, nor is man always an unconcerned spectator here. The bird-catchers have got an art for counterfeiting the cry of the owl exactly; and having before limed the branches of a hedge, they sit unseen and give the call. At this all the little birds flock to the place where they expect to find their well-known enemy; but instead of finding their stupid antagonist, they are stuck fast to the hedge themselves. This sport must be put in practice an hour before night-fall, in order to be successful; for if it is put off till later, those birds which but a few minutes sooner came to provoke their enemy, will then fly from him with as much terror as they just before showed insolence.

It is not unpleasant to see one stupid bird made in some sort a decoy to deceive another. The great horned owl is sometimes made use of for this purpose, to lure the kite when falconers desire to catch him for the purposes of training the falcon. Upon this occasion they clap the tail of a fox to the great owl, to render his figure extraordinary, in which trim he sails slowly along, flying low, which is his usual manner. The kite, either curious to observe this odd kind of animal, or perhaps inquisitive to see whether it may not be proper for food, flies after, and comes nearer and nearer. In this manner he continues to hover, and sometimes to descend, till the falconer setting a strong-winged hawk against him, seizes him for the purpose of training his young ones at home.

The usual place where the great horned owl breeds is in the cavern of a rock, the hollow of a tree, or the turret of some ruined castle. Its nest is near three feet in diameter, and composed of sticks bound together by the fibrous roots of trees, and lined with leaves on the inside. It lays about three eggs, which are larger than those of a hen, and of a colour somewhat resembling the bird itself. The young ones are very voracious, and the parents not less expert at satisfying the call of hunger. The lesser owl of this kind never makes a nest for itself, but always takes up with the old nest of some other bird, which it has often been forced to abandon. It lays four or five eggs, and the young are all white at first, but change colour in about a fortnight. The other owls in general build near the place where they chiefly prey; that which feeds upon birds in some neighbouring grove; that which preys chiefly upon mice, near some farmer's yard, where the proprietor of the place takes care to give it perfect security. In fact, whatever mischief one species of owl may do in the woods, the barn-owl makes a sufficient recompense for, by being equally active in destroying mice nearer home; so that a single owl is said to be more serviceable than half a dozen cats in ridding the barn of its domestic vermin. "In the year 1580," says an old writer, "at Hallontide, an army of mice so overrun the marshes near Southminster, that they eat up the grass to the very roots. But at length a great number of strange painted owls came and devoured all the mice. The like happened again in Essex about sixty years after."

To conclude our account of these birds, they are all very shy of man, and extremely indocile and difficult to be tamed. The white owl in particular, as Mr. Buffon asserts, cannot be made to live in captivity; I suppose he means if it be taken when old. "They live," says he, "ten or twelve days in the aviary where they are shut up, but they refuse all kind of nourishment, and at last die for hunge

By day they remain without moving from the floor of the aviary; in the evening they mount on the highest perch, where they continue to make a noise like a man snoring with his mouth open. This seems designed as a call for their old companions without; and, in fact, I have seen several others come to the call, and perch upon the roof of the aviary, where they made the same kind of hissing, and soon after permitted themselves to be taken in a net."

BOOK III.

OF BIRDS OF THE POULTRY KIND.

CHAPTER I.

OF BIRDS OF THE POULTRY KIND IN GENERAL.

FROM the most rapacious and noxious tribe of birds, we make a transition to those which of all others are the most harmless, and the most serviceable to man. He may force the rapacious tribes to assist his pleasures in field, or induce the smaller warblers to delight him with their singing; but it is from the poultry kind that he derives the most solid advantages, as they not only make a considerable addition to the necessaries of life, but furnish out the greatest delicacies to every entertainment.

Almost, if not all the domestic birds of the poultry kind that we maintain in our yards, are of foreign extraction; but there are others to be ranked in this class that are as yet in a state of nature; and perhaps only wait till they become sufficiently scarce to be taken under the care of man, to multiply their propagation. It will appear remarkable enough, if we consider how much the tame poultry which we have imported from distant climates has increased, and how much those wild birds of the poultry kind that have never yet been taken into keeping have been diminished and destroyed. They are all thinned; and many of the species, especially in the more cultivated and populous parts of the kingdom, are utterly unseen.

Under birds of the poultry kind I rank all those that have white flesh, and comparatively to their head and limbs, have bulky bodies. They are furnished with short strong bills for picking up grain, which is their chief, and often their only sustenance. Their wings are short and concave; for which reason they are not able to fly far. They lay a great many eggs; and as they lead their young abroad the very day they are hatched, in quest of food, which they are shown by the mother, and which they pick up for themselves; they generally make their nests on the ground. The toes of all these are united by a membrane as far as the first articulation, and then are divided as in those of the former class.

Under this class we may therefore rank the common cock, the peacock, the turkey, the pintada or Guinea-hen, the pheasant, the bustard the grouse, the partridge, and the quail. These all bear a strong similitude to each other, being equally granivorous, fleshy, and delicate to the palate. These are among birds what beasts of pasture are among quadrupeds, peaceable tenants of the field, and shunning the thicker parts of the forest that abounds with numerous animals, who carry on unceasing hostilities against them.

As Nature has formed the rapacious class for war, so she seems equally to have fitted these for peace, rest, and society. Their wings are but short, so that they are illy formed for wandering from one region to another; their bills are also short, and incapable of annoying their opposers; their legs are strong, indeed, but their toes are made for scratching up their food, and not for holding or tearing it. These are sufficient indications of their harmless nature; while their bodies, which are fat and fleshy, render them unwieldy travellers, and incapable of straying far from each other.

Accordingly we find them chiefly in society; they live together; and though they may have their disputes, like all other animals, upon some occasions, yet when kept in the same district, or feed in the same yard, they learn the arts of subordination; and in proportion as each knows his strength, he seldom tries a second time the combat where he has been once worsted.

In this manner all of this kind seem to lead an indolent, voluptuous life, as they are furnished internally with a very strong stomach, commonly called a gizzard, so their voraciousness scarce knows any bounds. If kept in close captivity, and separated from all their former companions, they still have the pleasure of eating left; and they soon grow fat and unwieldy in their prison. To say this more simply, many of the wilder species of birds, when cooped or caged pine away, grow gloomy, and some refuse all sustenance whatsoever; none, except those of the poultry kind, grow fat, who seem to lose all remembrance of their former liberty, satisfied with indolence and plenty.

The poultry kind may be considered as sensual epicures, solely governed by their appetites. The indulgence of these seems to influence their other habits, and destroys among them that connubial fidelity for which most other kinds are remarkable. The eagle and falcon, how fierce soever to other animals, are yet gentle and true to each other; their connections when once formed, continue till death; and the male and female, in every exigence, and every duty, lend faithful assistance to each other. They assist each other in the production of their young, in providing for them when produced; and even then, though they drive them forth to fight their own battles, yet the old ones still retain their former affection to each other, and seldom part far asunder.

But it is very different with this luxurious class I am now describing. Their courtship is but short, and their congress fortuitous The male takes no heed of his offspring; and satisfied with the pleasure of getting, leaves to the female all the care of providing for posterity. Wild and irregular in his appetites, he ranges from one to another, and claims every female which he is strong enough to keep from his fellows. Though timorous when opposed to birds of prey, yet he is incredibly bold among those of his own kind; and but to see a male of his own species is sufficient to produce a combat. As his desires extend to all, every creature becomes his enemy that pretends to be his rival.

The female, equally without fidelity or attachment, yields to the most powerful. She stands by, a quiet, meretricious spectator of their fury, ready to reward the conqueror with every compliance. She takes upon herself all the labour of hatching and bringing up her young, and chooses a place for hatching as remote as possible from the cock. Indeed, she gives herself very little trouble in making a nest, as her young ones are to forsake it the instant they part from the shell.

She is equally unassisted in providing for her young, that are not fed with meat put into their mouths, as in other classes of the feathered kind, but peck their food, and forsaking their nests, run here and there, following the parent wherever it is to be found. She leads them forward where they are likely to have the greatest quantity of grain, and takes care to show, by pecking, the sort proper for them to seek for. Though at other times voracious, she is then abstemious to an extreme degree, and intent only on providing for, and showing her young clutch their food, she scarce takes any nourishment herself. Her parental pride seems to overpower every other appetite, but that decreases in proportion as her young ones are more able to provide for themselves, and then all her voracious habits return.

Among the other habits peculiar to this class of birds is that of dusting themselves. They lie flat in some dusty place, and with their wings and feet raise and scatter the dust over their whole body. What may be their reason for thus doing, it is not easy to explain. Perhaps the heat of their bodies is such that they require this powder to be interposed between their feathers, to keep them from lying too close together, and thus increasing that heat with which they are incommoded.

CHAPTER II.

OF THE COCK.

ALL birds taken under the protection of man lose a part of their natural figure, and are altered not only in their habits but their very form. Climate, food, and captivity, are three very powerful agents in producing these alterations; and those birds that have longest felt their influence under human direction, are the most likely to have the greatest variety in their figures, their plumage, and their dispositions.

Of all other birds, the cock seems to be the oldest companion of mankind, to have been first reclaimed from the forest, and taken to supply the accidental failure of the luxuries or necessities of life. As he is thus longest under the care of man, so of all others perhaps he exhibits the greatest number of varieties, there being scarce two birds of this species that exactly resemble each other in plumage and form. The tail, which makes such a beautiful figure in the generality of these birds, is yet found entirely wanting in others; and not only the tail but the rump also. The toes, which are usually four in all animals of the poultry kind, yet in a species of the cock are found to amount to five. The feathers which lie so sleek, and in such beautiful order in most of those we are acquainted with, are in a peculiar breed all inverted, and stand staring the wrong way. Nay, there is a species that comes from Japan, which, instead of feathers, seems to be covered over with hair. These, and many other varieties, are to be found in this animal, which seem to be the marks this early prisoner bears of his long captivity.

It is not well ascertained when the cock was first made domestic in Europe, but it is generally agreed that we first had him in our western world from the kingdom of Persia. Aristophanes calls the cock the *Persian bird*, and tells us he enjoyed that kingdom before some of its earliest monarchs. This animal was in fact known so early even in the most savage parts of Europe, that we are told the cock was one of the forbidden foods among the ancient Britons. Indeed, the domestic fowl seems to have banished the wild one. Persia itself, that first introduced it to our acquaintance, seems no longer to know it in its natural form; and if we did not find it wild in some of the woods of India, as well as those of the islands of the Indian ocean, we might begin to doubt, as we do with regard to the sheep, in what form it first existed in a state of Nature.

But those doubts no longer exist: the cock is found in the island of Tinian, in many others of the Indian ocean, and in the woods on the coast of Malabar, in his ancient state of independence. In his wild condition his plumage is black and yellow, and his comb and wattles yellow and purple. There is another peculiarity also in those of the Indian woods; their bones, which when boiled, with us are white, as every body knows, in those are as black as ebony. Whether this tincture proceeds from their food, as the bones are tinctured red by feeding upon madder, I leave to the discussion of others: satisfied with the fact, let us decline speculation.

In their first propagation in Europe, there were distinctions then that now subsist no longer. The ancients esteemed those fowls whose plumage was reddish as invaluable; but as for the white it was considered as utterly unfit for domestic purposes. These they regarded as subject to become a prey to rapacious birds; and Aristotle thinks them less fruitful than the former. Indeed, his division of those birds seems to be taken from their culinary uses; the one sort he calls generous and noble, being remarkable for fecundity; the other sort, ignoble and useless, from their sterility. These distinctions differ widely from our modern notions of generosity in this animal; that which we call the *game-cock*, being by no means so fruitful as the ungenerous *dung-hill cock*, which we treat with contempt. The Athenians had their cock-matches as well as we: but it is probable they did not enter into our refinement of choosing out the most barren of the species for the purposes of combat.

However this be, no animal in the world has greater courage than the cock, when opposed to one of his own species; and in every par-of the world where refinement and polished manners have not entirely taken place, cock-fighting is a principal diversion. In China, India, the Philippine islands, and all over the East, cock-fighting is the sport and amusement even of kings and princes. With us it is declining every day; and it is to be hoped it will in time become only the pastime of the lowest vulgar. It is the opinion of many, that we have a bolder and more valiant breed than is to be found elsewhere: and some, indeed, have entered into a serious discussion upon the cause of so flattering a singularity. But the truth is, they have cocks in China as bold, if not bolder than ours; and, what would still be considered as valuable among cockers here, they have more strength with less weight. Indeed, I have often wondered why men who lay two or three hundred pounds upon the prowess of a single cock, have not taken every method to improve the breed. Nothing it is probable, could do this more effectually than by crossing the *strain*, as it is called, by a foreign mixture; and whether having recourse even to the wild cock in the forests of India would not be useful, I leave to their consideration. However, it is a mean and ungenerous amusement, nor would I wish much to promote it. The truth is, I could give such instructions with regard to cock-fighting, and could so arm one of these animals against the other, that it would be almost impossible for the adversary's cock to survive the first or second blow; but as Boerhaave has said upon a former occasion, when he was treating upon poisons, " to teach the arts of cruelty is equivalent to committing them."

This extraordinary courage in the cock is thought to proceed from his being the most salacious of all other birds whatsoever. A single cock suffices for ten or a dozen hens; and it is said of him that he is the only animal whose spirits are not abated by indulgence. But then he soon grows old; the radical moisture is exhausted; and in three or four years he becomes utterly unfit for the purposes of impregnation. "Hens, also," to use the words of Willoughby, "as they for the greatest part of the year daily lay eggs, cannot suffice for so many births, but for the most part after three years become effete and barren: for when they have exhausted all their seed-eggs, of which they had but a certain quantity from the beginning, they must necessarily cease to lay, there being no new ones generated within."

The hen seldom clutches a brood of chickens above once a season, though instances have been known in which they produced two. The number of eggs a domestic hen will lay in the year are above two hundred, provided she be well fed, and supplied with water and liberty. It matters not much whether she be trodden by the cock or no; she will continue to lay, although, all the eggs of this kind can never, by hatching, be brought to produce a living animal. Her nest is made without any care, if left to herself; a hole scratched into the ground, among a few bushes, is the only preparation she makes for this season of patient expectation. Nature, almost exhausted by its own fecundity, seems to inform her of the proper time for hatching, which she herself testifies by a clucking note, and by discontinuing to lay. The good housewives, who often get more by their hens laying than by their chickens, artificially protract this clucking season, and sometimes entirely remove it. As soon as their hens begins to cluck, they stint her in her provisions, and if that fails, they plunge her into cold water; this, for the time, effectually puts back her hatching; but then it often kills the poor bird, who takes cold, and dies under the operation.

If left entirely to herself, the hen would seldom lay above twenty eggs in the same nest, without attempting to hatch them: but in proportion as she lays, her eggs are removed; and she continues to lay, vainly hoping to increase the number. In the wild state the hen seldom lays above fifteen eggs; but then her provision ismore difficultly obtained, and she is perhaps sensible of the difficulty of maintaining too numerous a family.

When the hen begins to sit, nothing can exceed her perseverance and patience; she continues for some days immoveable; and when forced away by the importunities of hunger, she quickly returns. Sometimes, also, her eggs become too hot for her to bear, especially if she be furnished with too warm a nest within doors, for then she is obliged to leave them to cool a little: thus the warmth of the nest only retards incubation, and often puts the brood a day or two back in the shell. While the hen sits, she carefully turns her eggs, and even removes them to different situations, till at length, in about three weeks, the young brood begins to give signs of a desire to burst their confinement. When by the repeated efforts of their bill, which serves like a pioneer on this occasion, they have broke themselves a passage through the shell, the hen still continues to sit till all are excluded. The strongest and best chickens generally are the first candidates for liberty: the weakest come behind, and some even die in the shell. When all are produced, she then leads them forth to provide for themselves. Her affection and her pride seem then to alter her very nature, and correct her imperfections. No longer voracious or cowardly, she abstains from all food that her young can swallow, and flies boldly at every creature that she thinks is likely to do them mischief. Whatever the invading animal be, she boldly attacks him; the horse, the hog, or the mastiff. When marching at the head of her little troop, she acts the commander, and has a variety of notes to call her numerous train to their food, or to warn them of approaching danger. Upon one of these occasions, I have seen the whole brood run for security into the thickest part of a hedge, when the hen herself ventured boldly forth, and faced a fox that came for plunder. With a good mastiff, however, we soon sent the invader back to his retreat; but not before he had wounded the hen in several places.

Ten or twelve chickens are the greatest number that a good hen can rear and clutch at a time; but as this bears no proportion to the number of her eggs, schemes have been imagined to clutch all the eggs of a hen, and thus turn her produce to the greatest advantage. By these contrivances it has been obtained that a hen that ordinarily produces but twelve chickens in the year, is found to produce as many chickens as eggs, and consequently often above two hundred The contrivance I mean is the artificial method of hatching chickens in stoves, as is practised at Grand Cairo, or in a chymical elaboratory properly graduated, as has been effected by Mr. Reaumur. At Grand Cairo, they thus produce six or seven thousand chickens at a time, where, as they are brought forth in their mild spring, which is warmer than our summer, the young ones thrive without clutching. But it is otherwise in our colder and unequal climate; the little animal may without much difficulty be hatched from the shell; but they almost all perish when excluded. To remedy this, Reaumur has made use of a woollen hen, as he calls it, which was nothing more than putting the young ones in a warm basket, and clapping over them a thick woollen canopy. I should think a much better substitute might be found; and this from among the species themselves. Capons may very easily be taught to clutch a fresh brood of chickens throughout the year; so that when one little colony is thus reared, another may be brought to succeed it. Nothing is more common than to see capons thus employed, and the manner of teaching them is this: first the capon is made very tame, so as to feed from one's hand; then about evening, they pluck the feathers off his breast, and rub the bare skin with nettles; they then put the chickens to him, which presently run under his breast and belly, and probably rubbing his bare skin gently with their heads allay the stinging pain which the nettles had just produced. This is repeated for two or three nights, till the animal takes an affection to the chickens that have thus given him relief, and continues to give them the protection they seek for: perhaps also the querulous voice of chickens may be pleasant to him in misery, and invite him to succour the distressed. He from that time brings up a brood of chickens like a hen, clutching them, feeding them, clucking, and performing all the functions of the tenderest parent. A capon once accustomed to this service, will not give over; but when one brood is grown up, he may have another nearly hatched put under him, which he will treat with the same tenderness he did the former.

The cock, from his salaciousness, is allowed to be a short lived animal; but how long these birds live, if left to themselves, is not yet well ascertained by any historian. As they are kept only for profit, and in a few years become unfit for generation, there are few that, from mere motives of curiosity, will make the tedious experiment of maintaining a proper number till they die. Aldrovandus hints their age to be ten years; and it is probable that this may be its extent. They are subject to some disorders, which it is not our business to describe; and as for poisons, besides nux vomica, which is fatal to most animals except man, they are injured, as Linnæus asserts, by elder-berries, of which they are not a little fond.

CHAPTER III.

OF THE PEACOCK.

THE Peacock, by the common people of Italy, is said to have the plumage of an angel, the voice of a devil, and the guts of a thief. In fact each of these qualities mark pretty well the nature of this

Turkey, p. 93.

Wild Turkey, p. 93.

Peacock, p. 90.

To face p. 90, vol. iii.

extraordinary bird. When it appears with its tail expanded, there is none of the feathered creation can vie with it for beauty; yet the horrid scream of its voice serves to abate the pleasure we find from viewing it; and still more, its insatiable gluttony and spirit of depredation, make it one of the most noxious domestics that man has taken under his protection.

Our first peacocks were brought from the East-Indies; and we are assured that they are still found in vast flocks in a wild state in the islands of Java and Ceylon. So beautiful a bird, and one esteemed such a delicacy at the tables of the luxurious, could not be permitted to continue long at liberty in its distant retreats. So early as the days of Solomon, we find in his navies, among the articles imported from the East, apes and peacocks. Ælian relates that they were brought into Greece from some barbarous country, and were held in such high esteem among them that a male and female were valued at above thirty pounds of our money. We are told also that when Alexander was in India, he found them flying wild in vast numbers on the banks of the river Hyarotis, and was so struck with their beauty that he laid a severe fine and punishment on all who should kill or disturb them. Nor are we to be surprised at this, as the Greeks were so much struck with the beauty of this bird, when first brought among them, that every person paid a fixed price for seeing it; and several people came to Athens, from Lacedæmon and Thessaly, purely to satisfy their curiosity.

It was probably first introduced into the West, merely on account of its beauty; but mankind, from contemplating its figure, soon came to think of serving it up for a different entertainment. Aufidius Hurco stands charged by Pliny with being the first who fatted up the peacock for the feasts of the luxurious. Whatever there may be of delicacy in the flesh of a young peacock, it is certain an old one is very indifferent eating; nevertheless, there is no mention made of choosing the youngest: it is probable they were killed indiscriminately, the beauty of the feathers in some measure stimulating the appetite. Hortensius, the orator, was the first who served them up in an entertainment at Rome, and from that time they were considered as one of the greatest ornaments of every feast. Whether the Roman method of cookery, which was much higher than ours, might not have rendered them more palatable than we find them at present, I cannot tell; but certain it is, they talk of the peacock as being the first of viands.

Its fame for delicacy, however, did not continue very long; for we find in the time of Francis the First, that it was a custom to serve up peacocks to the tables of the great, with an intention not to be eaten, but only to be seen. Their manner was, to strip off the skin, and then preparing the body with the warmest spices, they covered it up again in its former skin, with all its plumage in full display, and no way injured by the preparation. The bird thus prepared, was often preserved for many years without corrupting; and it is asserted of the peacock's flesh, that it keeps longer unputrefied than that of any other animal. To give a higher zest to these entertainments, on weddings particularly, they filled the bird's beak and throat with cotton and camphire, which they set on fire, to amuse and delight the company

I do not know that the peacock is much used at our entertainments at present, except now and then at an alderman's dinner, or a common-council feast, when our citizens resolve to be splendid; and even then it is never served with its cotton and camphire.

Like other birds of the poultry kind, the peacock feeds upon corn, but its chief predilection is for barley. But as it is a very proud and fickle bird, there is scarce any food that it will not at all times covet and pursue. Insects and tender plants are often eagerly sought at a time that it has a sufficiency of its natural food provided more nearly. In the indulgence of these capricious pursuits, walls cannot easily confine it, it strips the tops of houses of their tiles or thatch, it lays waste the labours of the gardener, roots up his choicest seeds, and nips his favorite flowers in the bud. Thus its beauty but illy recompenses for the mischief it occasions; and many of the more homely looking fowls are very deservedly preferred before it.

Nor is the peacock less a debauchee in its affections, than a glutton in its appetites. He is still more salacious than even the cock: and though not possessed of the same vigour, yet burns with more immoderate desire. He requires five females at least to attend him; and if there be not a sufficient number, he will even run upon and tread the sitting hen. For this reason, the peahen endeavours, as much as she can, to hide her nest from the male, as he would otherwise disturb her sitting, and break her eggs.

The peahen seldom lays above five or six eggs in this climate before she sits. Aristotle describes her as laying twelve; and it is probable, in her native climate, she is thus prolific; for it is certain that in the forests where they breed naturally, they are numerous beyond expression. The bird lives about twenty years, and not till its third year has it that beautiful variegated plumage that adorns its tail.

"In the kingdom of Cambaya," says Taverner, "near the city of Baroch, whole flocks of them are seen in the fields. They are very shy, however, and it is impossible to come near them. They run off swifter than the partridge, and hide themselves in the thickets, where it is impossible to find them. They perch by night upon trees; and the fowler often approaches them at that season with a kind of banner, on which a peacock is painted to the life on either side. A lighted torch is fixed on the top of this decoy; and the peacock, when disturbed, flies to what it takes for another, and is thus caught in a nooze, prepared for that purpose."

There are varieties of this bird, some of which are white, others crested: that which is called the *Peacock of Thibet*, is the most beautiful of the feathered creation, containing in its plumage all the most vivid colours, red, blue, yellow, and green, disposed in an almost artificial order, as if merely to please the eye of the beholder.

CHAPTER IV.

THE TURKEY.

THE natal place of the cock and peacock is pretty well ascertained, but there are stronger doubts concerning the turkey; some contending that it has been brought into Europe from the East-Indies many centuries ago, while others assert that it is wholly unknown in that part of the world, that it is a native of the New Continent, and that it was not brought into Europe till the discovery of that part of the world.

Those who contend for the latter opinion, very truly observe, that among all the descriptions we have of eastern birds, that of the turkey is not to be found; while, on the contrary, it is very well known in the New Continent, where it runs wild about the woods. It is said by them to have been first seen in France, in the reign of Francis I. and in England in that of Henry VIII. which is about the time when Mexico was first conquered by Spain. On the other hand, it is asserted, that the turkey, so far from being unknown in Europe before that time, was known even to the ancients, and that Ælian has given a pretty just description of it. They allege, that its very name implies its having been brought from some part of the east, and that it is found, among other dainties, served up at the tables of the great, before that time among ourselves. But what they pretend to be the strongest proof is, that though the wild turkey be so very common in America, yet the natives cannot contrive to tame it; and though hatched in the ordinary manner, nothing can render it domestic. In this diversity of opinions, perhaps it is best to suspend assent, till more lights are thrown on the subject; however, I am inclined to concur with the former opinion.

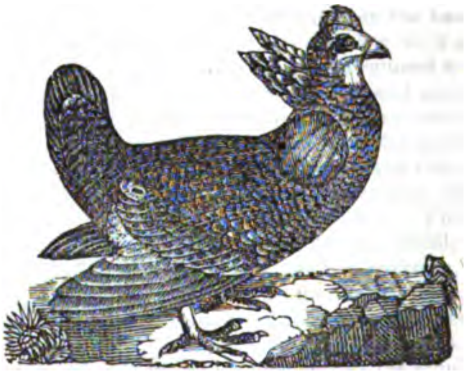
With us, when young, it is one of the tenderest of all birds; yet, in its wild state, it is found in great plenty in the forests of Canada, that are covered with snow above three parts of the year. In their natural woods they are found much larger than in their state of domestic captivity. They are much more beautiful also, their feathers being of a dark grey, bordered at the edges with a bright gold colour. These the savages of the country weave into cloaks to adorn their persons, and fashion into fans and umbrellas, but never once think of taking into keeping animals that the woods furnish them with in sufficient abundance. Savage man seems to find a delight in precarious possession. A great part of the pleasure of the chase lies in the uncertainty of the pursuit, and he is unwilling to abridge himself in any accidental success that may attend his fatigues. The hunting the turkey, therefore, makes one of his principal diversions, as its flesh contributes chiefly to the support of his family. When he has discovered the place of their retreat, which, in general, is near fields of nettles, or where there is plenty of any kind of grain, he takes his dog with him, which is trained to the sport, (a faithful, rough creature supposed to be originally reclaimed from the wolf) and he sends him into the midst of the flock. The turkey no sooner perceive their enemy than they set off running at full speed, and with such swiftness tha they leave the dog far behind them; he follows, nevertheless, and sensible they must soon be tired, as they cannot go full speed for any length of time, he at last forces them to take shelter in a tree, where they sit quite spent and fatigued, till the hunter comes up, and with a long pole knocks them down one after another.

This manner of suffering themselves to be destroyed, argues no great instinct in the animal; and indeed, in their captive state, they do not appear to be possessed of much. They seem a stupid, vain, querulous tribe, apt enough to quarrel among themselves, yet without any weapons to do each other any injury. Every body knows the strange antipathy the turkey-cock has to a red colour; how he bristles, and with his peculiar gobbling sound flies to attack it. But there is another method of increasing the animosity of these birds against each other, which is often practised by boys, when they have a mind for a battle. This is no more than to smear over the head of one of the turkeys with dirt, and the rest run to attack it with all the speed of impotent animosity: nay, two of them thus disguised will fight each other till they are almost suffocated with fatigue and anger.

But though so furious among themselves, they are weak and cowardly against other animals, though far less powerful than they. The cock often makes the turkey keep at a distance, and they seldom venture to attack him but with united force, when they rather oppress him by their weight than annoy him by their arms. There is no animal, how contemptible soever, that will venture boldly to face the turkey-cock, that he will not fly from. On the contrary, with the insolence of a bully he pursues any thing that seems to fear him, particularly lap-dogs and children, against both which he seems to have a peculiar aversion. On such occasions, after he has made them scamper, he returns to his female train, displays his plumage around, struts about the yard, and gobbles out a note of self-approbation.

The female seems of a milder, gentler disposition. Rather querulous than bold, she hunts about in quest of grain, and pursuit of insects, being particularly delighted with the eggs of ants and caterpillars. She lays eighteen or twenty eggs, larger than those of a hen, whitish, but marked with spots resembling the freckles of the face. Her young are extremely tender at first, and must be carefully fed with curd chopped with dock leaves; but as they grow older, they become more hardy, and follow the mother to considerable distances in pursuit of insect food, which they prefer to any other. On these occasions, however, the female though so large, and, as it would seem, so powerful a bird, gives them but very little protection against the attacks of any rapacious animal that comes in her way. She rather warns her young to shift for themselves than prepares to defend them. "I have heard," says the Abbé la Pluche, "a turkey-hen, when at the head of her brood, send forth the most hideous screams, without knowing as yet the cause: however, her young, immediately when the warning was given, skulked under the bushes, the grass, or whatever else offered for shelter or protection. They even stretched them

Peacock Pheasant. p. 95.



American Grouse, or Heath Hen, p. 101.

Ruffed Grouse. p. 101.

To face p. 95, vol. iii.

selves at their full length upon the ground, and continued lying as motionless as if they were dead. In the mean time the mother, with her eyes directed upwards, continued her cries and screaming as before. Upon looking up to where she seemed to gaze, I discovered a black spot just under the clouds, but was unable at first to determine what it was; however, it soon appeared to be a bird of prey, though at first at too great a distance to be distinguished. I have seen one of these animals continue in this violent, agitated state, and her whole brood pinned down as it were to the ground, for four hours together, whilst their formidable foe has taken his circuits, has mounted, and hovered directly over their heads: at last, upon disappearing, the parent began to change her note, and sent forth another cry, which in an instant gave life to the whole trembling tribe, and they all flocked round her with expressions of pleasure, as if conscious of their happy escape from danger."

When once grown up, turkeys are very hardy birds, and feed themselves at very little expense to the farmer. Those of Norfolk are said to be the largest of this kingdom, weighing from twenty to thirty pounds. There are places, however, in the East Indies, where they are known only in their domestic state, in which they grow to the weight of sixty pounds

CHAPTER V

THE PHEASANT

IT would surprise a sportsman to be told that the pheasant, which he finds wild in the woods, in the remotest parts of the kingdom, and in forests which can scarce be said to have an owner, is a foreign bird, and was at first artificially propagated amongst us. They were brought into Europe from the banks of the Phasis, a river of Colchis, in Asia Minor, and whence they still retain their name.

Next to the peacock, they are the most beautiful of birds, as well for the vivid colour of their plumes, as for their happy mixtures and variety. It is far beyond the power of the pencil to draw any thing so glossy. so bright, or points so finely blending into each other. We are told that when Crœsus, king of Lydia, was seated on his throne, adorned with royal magnificence, and all the barbarous pomp of Eastern splendour, he asked Solon if he had ever beheld any thing so fine? The Greek philosopher, no way moved by the objects before him, or taking a pride in his native simplicity, replied, that after having seen the beautiful plumage of the pheasant, he could be astonished at no other finery.

In fact nothing can satisfy the eye with a greater variety and richness of ornament than this beautiful creature. The iris of the eye is yellow, and the eyes themselves are surrounded with a scarlet colour sprinkled with small specks of black. On the fore-part of the head there are blackish feathers mixed with a shining purple. The top of the head and the upper part of the neck are tinged with a darkish green that shines like silk. In some the top of the head is of a shining blue, and the head itself, as well as the upper part of the neck, appears sometimes blue and sometimes green, as it is differently placed to the eye of the spectator. The feathers of the breast, the shoulders, the middle of the back, and the sides under the wings, have a blackish ground, with edges tinged of an exquisite colour, which appears sometimes black and sometimes purple, according to the different lights it is placed in: under the purple there is a transverse streak of gold colour. The tail from the middle feathers to the root is about eighteen inches long; the legs, the feet, and the toes are of the colour of horn. There are black spurs on the legs, shorter than those of a cock; there is a membrane that connects two of the toes together, and the male is much more beautiful than the female.

This bird, though so beautiful to the eye, is not less delicate when served up to the table. Its flesh is considered as the greatest dainty; and when the old physicians spoke of the wholesomeness of any viands, they made their comparison with the flesh of the pheasant. However, notwithstanding all these perfections to tempt the curiosity or the palate, the pheasant has multiplied in its wild state; and, as if disdaining the protection of man, has left him, to take shelter in the thickest woods and the remotest forests. All others of the domestic kind, the cock, the turkey, or the pintada, when once reclaimed, have still continued in their domestic state, and persevered in the habits and appetites of willing slavery. But the pheasant, though taken from its native warm retreats, where the woods supply variety of food, and the warm sun suits its tender constitution, has still continued its attachment to native freedom; and now wild among us, makes the most envied ornament of our parks and forests, where he feeds upon acorns and berries, and the scanty produce of our chilling climate.

This spirit of independence seems to attend the pheasant even in captivity. In the woods the hen pheasant lays from eighteen to twenty eggs in a season; but in a domestic state she seldom lays above ten. In the same manner, when wild she hatches and leads up her brood with patience, vigilance, and courage; but when kept tame she never sits well; so that a hen is generally her substitute upon such occasions; and as for leading her young to their food, she is utterly ignorant of where it is to be found, and the young birds starve, if left solely to her protection. The pheasant, therefore, on every account seems better left at large in the woods, than reclaimed to pristine captivity. Its fecundity, when wild, is sufficient to stock the forests; its beautiful plumage adorns it; and its flesh retains a higher flavour from its unlimited freedom.

However, it has been the aim of late to take these birds once more from the woods, and to keep them in places fitted for their reception. Like all others of the poultry kind, they have no greater sagacity, and suffer themselves easily to be taken. At night they roost upon the highest trees of the wood; and by day they come down into the lower brakes and bushes, where their food is chiefly found. They generally make a kind of flapping noise when they are with the females, and this often apprises the sportsman of their retreats. At other times he tracks them in the snow, and frequently takes them in springes. But of all birds they are shot most easily, as they always make a whirring noise when they rise, by which they alarm the gunner, and being a large mark, and flying very slow, there is scarce any missing them.

> Ah! what avails his glossy, varying dyes,
> His purpled crest, and scarlet circled eyes,
> The vivid green his shining plumes unfold,
> His painted wings, and breast that flames with gold? Pope.

When these birds are taken young into keeping, they become as familiar as chickens; and when they are designed for breeding, they are put together in a yard, five hens to a cock; for this bird, like all of the poultry kind, is very salacious. In her natural state the female makes her nest of dry grass and leaves; the same must be laid for her in the pheasantry, and she herself will sometimes properly dispose them. If she refuses to hatch her eggs, then a common hen must be got to supply her place, which task she will perform with perseverance and success. The young ones are very difficult to be reared; and they must be supplied with ants' eggs, which is the food the old one leads them to gather when wild in the woods. To make these go the farther, they are to be chopped up with curds or other meat; and the young ones are to be fed with great exactness, both as to the quantity and the time of their supply. This food is sometimes also to be varied, and wood-lice, earwigs, and other insects, are to make a variety. The place where they are reared must be kept extremely clean; their water must be changed twice or thrice a day; they must not be exposed till the dew is off the ground in the morning; and they should always be taken in before sun-set. When they become adult, they can very well shift for themselves, but they are particularly fond of oats and barley.

In order to increase the breed, and make it still more valuable, Longolius teaches us a method that appears very peculiar. The pheasant is a very bold bird when first brought into the yard among other poultry, not sparing the peacock, nor even such young cocks and hens as it can master; but after a time it will live tamely among them, and will at last be brought to couple with a common hen. The breed thus produced takes much stronger after the pheasant than the hen; and in a few successions, if they be left to breed with the cock-pheasant, for the mixture is not barren, there will be produced a species more tame, stronger, and more prolific; so that he adds, that it is strange why most of our pheasantries are not stocked with birds produced in this manner.

The pheasant, when full grown, seems to feed indifferently upon every thing that offers. It is said by a French writer, that one of the king's sportsmen shooting at a parcel of crows that were gathered round a dead carcass, to his great surprise upon coming up, found that he had killed as many pheasants as crows. It is even asserted by some, that such is the carnivorous disposition of this bird, that when several of them are put together in the same yard, if one of them happens to fall sick, or seems to be pining, that all the rest will fall upon, kill, and devour it. Such is the language of books, those who have frequent opportunities of examining the manners of the bird itself, know what credit ought to be given to such an account.

Of the pheasant, as of all other domestic fowls, there are many varieties. There are white pheasants, crested pheasants, spotted pheasants; but of all others, the golden pheasant of China is the most beautiful. It is a doubt whether the peacock itself can bear the comparison. However, the natives of China would not have us consider it as their most beautiful bird, though covered all over with eyes, resembling in miniature those of the peacock. By their accounts, it is far exceeded by the fongwang, an imaginary bird, of which they give a most fantastic description. It is thus that the people of every country, though possessed of the greatest advantages, have still others that they would persuade strangers they enjoy, which have existence only in the imagination.

CHAPTER VI.

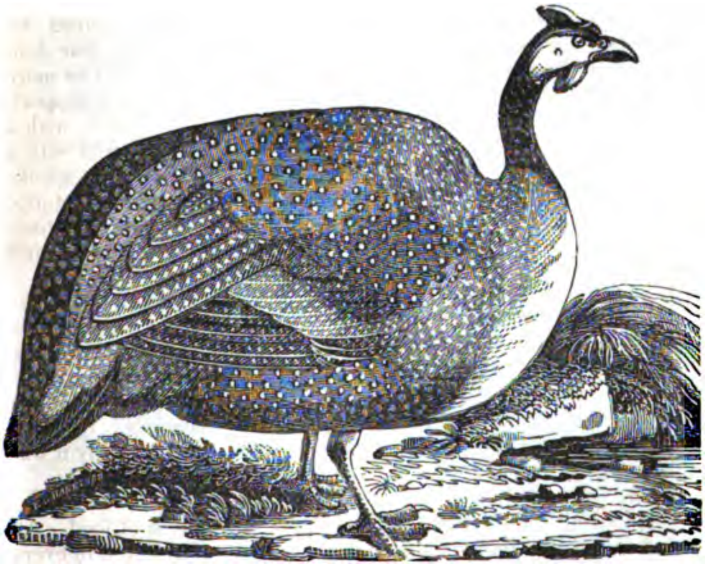
THE PINTADA, OR GUINEA-HEN.

THIS is a very remarkable bird, and in some measure unites the characteristics of the pheasant and the turkey. It has the fine delicate shape of the one, and the bare head of the other. To be more particular, it is about the size of a common hen, but as it is supported on longer legs, it looks much larger. It has a round back, with a tail turned downwards like a partridge. The head is covered with a kind of casque; and the whole plumage is black or dark grey, speckled with white spots. It has wattles under the bill, which do not proceed from the lower chap, as in cocks, but from the upper, which gives it a very peculiar air, while its restless gait and odd chuckling sound distinguish it sufficiently from all other birds whatever.

It is well known all over Europe, and even better than with us, as the nations that border on the Mediterranean probably had it before us from those parts of Africa which lie nearest. Accordingly we find it in different countries called by different names, from the place whence they had it. They are by some called the *Barbary-hen;* by others, the *tamis-bird;* and by others, the *bird of Numidia.* We have given it the name of that part of Africa from whence probably it was first brought.

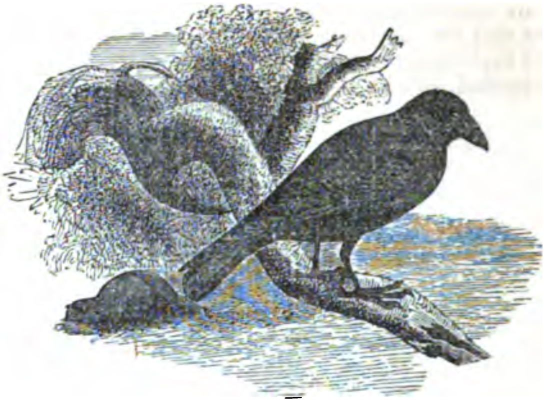
In many parts of their native country they are seen in vast flocks together, feeding their young, and leading them in quest of food. All their habits are like those of the poultry kind, and they agree in every other respect except that the male and female are so much alike that they can hardly be distinguished asunder. The only difference lies in the wattles described above, which in the cock are of a bluish cast; in the hen they are more inclining to a red. Their eggs, like their

Swallow, p. 153.



Pintada, p. 98.

To face p. 98, vol. iii.



Raven, p. 109.

Black Grouse, p. 101.

White Grouse, or Ptarmigan, p. 100

Wood Grouse, or Cock of the Woods, p. 101.

Bustard, p. 99

To face p. 99, vol. iii.

bodies, are speckled; in our climate they lay but five or six in a season; but they are far more prolific in their sultry regions at home They are kept among us rather for show than use, as their flesh is not much esteemed, and as they give a good deal of trouble in the rearing.

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CHAPTER VII.

THE BUSTARD.

THE Bustard is the largest land-bird that is a native of Britain It was once much more numerous than it is at present; but the increased cultivation of the country, and the extreme delicacy of its flesh, has greatly thinned the species; so that a time may come when it may be doubted whether ever so large a bird was bred among us It is probable that long before this the bustard would have been extirpated, but for its peculiar manner of feeding. Had it continued to seek shelter among our woods, in proportion as they were cut down, it must have been destroyed. If in the forest, the fowler might approach it without being seen, and the bird, from its size, would be too great a mark to be easily missed. But it inhabits only the open and extensive plain, where its food lies in abundance; and where every invader may be seen at a distance.

The bustard is much larger than the turkey, the male generally weighing from twenty-five to twenty-seven pounds. The neck is a foot long, and the legs a foot and a half. The wings are not proportionable to the rest of the body, being but four feet from the tip of the one to the other; for which reason the bird flies with great difficulty. The head and neck of the male are ash-coloured; the back is barred transversely with black, bright, and rust colour. The greater quill feathers are black; the belly white, and the tail, which consists of twenty feathers, is marked with broad black bars.

It would seem odd, as was hinted before, how so large a land-bird as this could find shelter in so cultivated a country as England; but the wonder will cease when we find it only in the most open countries, where there is scarce any approaching without being discovered. They are frequently seen in flocks of fifty or more, in the extensive downs of Salisbury-Plain, in the heaths of Sussex and Cambridgeshire, the Dorsetshire uplands, and so on as far as East-Lothian in Scotland. In those extensive plains, where there are no woods to screen the sportsman, nor hedges to creep along, the bustards enjoy an indolent security. Their food is composed of the berries that grow among the heath, and the large earth-worms that appear in great quantities on the downs before sun-rising in summer. It is in vain that the fowler creeps forward to approach them, they have always centinels placed at proper eminences, which are ever on the watch, and warn the flock of the smallest appearance of danger. All, therefore, that is left the sportsman, is the comfortless view of their distant security. He may wish, but they are in safety.

It sometimes happens that these birds, though they are seldom shot by the gun, are often run down by grey-hounds. As they are voracious and greedy, they often sacrifice their safety to their appetite, and feed themselves so very fat that they are unable to fly without great preparation. When the grey-hound, therefore, comes within a certain distance, the bustard runs off flapping its wings, and endeavouring to gather air enough under them to rise: in the mean time the enemy approaches nearer and nearer, till it is too late for the bird even to think of obtaining safety by flight; for just at the rise there is always time lost, and of this the bird is sensible; it continues, there fore, on the foot until it has got a sufficient way before the dog for flight, or until it is taken.

As there are few places where they can at once find proper food and security, so they generally continue near their old haunts, seldom wandering above twenty or thirty miles from home. As their food is replete with moisture, it enables them to live upon these dry plains, where there are scarcely any springs of water, a long time without drinking. Besides this, Nature has given the males an admirable magazine for their security against thirst. This is a pouch, the entrance of which lies immediately under the tongue, and capable of holding near seven quarts of water. This is probably filled upon proper occasions, to supply the hen when sitting, or the young before they can fly.

Like all other birds of the poultry kind, they change their mates at the season of incubation, which is about the latter end of summer They separate in pairs if there be a sufficiency of females for the males; but when this happens to be otherwise, the males fight until one of them falls. In France, they often find some of those victims to gallantry dead in the fields, and no doubt are not displeased at the occasion.

They make their nests upon the ground, only just scraping a hole in the earth, and sometimes lining it with a little long grass or straw. There they lay two eggs only, almost of the size of a goose egg, of a pale olive brown, marked with spots of a darker colour. They hatch in about five weeks, and the young ones run about as soon as they are out of the shell.

The bustards assemble in flocks in the month of October, and keep together till April. In winter, as their food becomes more scarce, they support themselves indiscriminately, by feeding on moles, mice, and even little birds, when they can seize them. For want of other food, they are contented to live upon turnip leaves, and such little succulent vegetables. In some parts of Switzerland, they are found frozen in the fields in severe weather; but when taken to a warm place, they again recover. They usually live fifteen years, and are incapable of being propagated in a domestic state, as they probably want that food which best agrees with their appetite.

CHAPTER VIII.

THE GROUSE AND ITS AFFINITIES.

THE Cock of the Wood, the Black Cock, the grouse, and the Ptarmigan :—These are all birds of a similar nature, and chiefly found in heathy mountains and piny forests, at a distance from mankind. They might once indeed have been common enough all over England, when a great part of the country was covered with heath; but at present their numbers are thinned: the two first of this kind are utterly unknown in the south, and have taken refuge in the northern parts of Scotland, where the extensive heaths afford them security, and the forests shelter.

The cock of the wood is sometimes of the size of a turkey, and often weighs near fourteen pounds; the black cock, of which the male is all over black, though the female is of the colour of a partridge, is about the size of a hen, and, like the former, is only found with us in the highlands of Scotland; the grouse is about half as large again as a partridge, and its colour much like that of a wood-cock, but redder; the ptarmigan is still somewhat less, and is a pale brown or ash-colour. They are all distinguishable from other birds of the poultry kind, by a naked skin, of a scarlet colour, above the eyes, in the place and of the figure of eye-brows.

It seems to be something extraordinary, that all the larger wild animals of every species choose the darkest and the inmost recesses of the woods for their residence, while the smaller kinds come more into the open and cultivated parts, where there is more food and more danger. It is thus with the birds I am describing: while the cock of the wood is seldom seen, except on the inaccessible parts of heathy mountains, or in the midst of piny forests, the grouse is found, in great numbers, in the neighbourhood of cornfields, where there is heath to afford retreat and shelter. Their food too somewhat differs; while the smaller kind lives upon heath blossoms, cranberries, and corn, the larger feeds upon the cones of the pine-tree; and will sometimes entirely strip one tree, before it offers to touch those of another, though just beside him. In other respects, the manners of these birds are the same; being both equally simple in their diet, and licentious in their amours.

The Cock of the Wood, for it is from him we will take our description, is, as was said, chiefly fond of a mountainous and woody situation. In winter he resides in the darkest and inmost part of the woods; in summer he ventures down from his retreats, to make short depredations on the farmer's corn. The delicacy of his flesh in some measure sets a high price upon his head; and as he is greatly sought after, so he continues, when he comes down from the hills, always on his guard. Upon these occasions, he is seldom surprised; and those who would take him, must venture up to find him in his native retreats.

The cock of the wood, when in the forest, attaches himself principally to the oak and the pine-tree; the cones of the latter serving for his food, and the thick boughs for a habitation. He even makes a choice of what cones he shall feed upon; for he sometimes will strip one tree bare before he will deign to touch the cones of another. He feeds also upon ants' eggs, which seem a high delicacy to all birds of the poultry kind: cranberries are likewise often found in his crop; and his gizzard, like that of domestic fowls, contains a quantity of gravel, for the purposes of assisting his powers of digestion.

At the earliest return of spring, this bird begins to feel the genial influence of the season. During the month of March, the approaches of courtship are continued, and do not desist till the trees have all their leaves, and the forest is in full bloom. During this whole season, the cock of the wood is seen at sun-rise and setting, extremely active upon one of the largest branches of the pine-tree. With his tail raised and expanded like a fan, and the wings drooping, he is seen walking backward and forward, his neck stretched out, his head swollen and red, and making a thousand ridiculous postures; his cry upon that occasion, is a kind of loud explosion, which is instantly followed by a noise like the whetting of a scythe, which ceases and commences alternately for about an hour, and is then terminated by the same explosion.

During the time this singular cry continues, the bird seems entirely deaf, and insensible of every danger: whatever noise may be made near him, or even though fired at, he still continues his call; and this is the time that sportsmen generally take to shoot him. Upon all other occasions, he is the most timorous and watchful bird in Nature: but now he seems entirely absorbed by his instincts; and seldom leaves the place where he first begins to feel the accesses of desire. This extraordinary cry, which is accompanied by a clapping of the wings, is no sooner finished, than the female hearing it replies, approaches, and places herself under the tree, from whence the cock descends to impregnate her. The number of females that, on this occasion, resort to his call, is uncertain; but one male generally suffices for all.

The female is much less than her mate, and entirely unlike him in plumage, so that she might be mistaken for a bird of another species: she seldom lays more than six or seven eggs, which are white, and marked with yellow, of the size of a common hen's egg; she generally lays them in a dry place, and a mossy ground, and hatches them without the company of the cock. When she is obliged, during the time of incubation, to leave her eggs in quest of food, she covers them up so artfully with moss or dry leaves, that it is extremely difficult to discover them. On this occasion she is extremely tame and tranquil, however wild and timorous in ordinary. She often keeps to her nest, though strangers attempt to drag her away.

As soon as the young ones are hatched, they are seen running with extreme agility after the mother, though sometimes they are not entirely disengaged from the shell. The hen leads them forward, for the first time, into the woods, shows them ants' eggs, and the wild mountain-berries, which, while young, are their only food. As they grow older, their appetites grow stronger, and they feed upon the tops of hether, and the cones of the pine-tree. In this manner they soon come to perfection: they are a hardy bird, their food lies every where before them, and it would seem that they should increase in great abundance. But this is not the case; their numbers are thinned by rapacious birds and beasts of every kind; and still more by their own salacious contests.

As soon as the clutching is over, which the female performs in the manner of a hen, the whole brood follows the mother for about a month or two, at the end of which the young males entirely forsake her, and keep in great harmony together till the beginning of Spring. At this season they begin, for the first time, to feel the genial access, and then adieu to all their former friendships! They begin to consider each other as rivals, and the rage of concupiscence quite extinguishes the spirit of society. They fight each other like game cocks, and at that time are so inattentive to their own safety that it often happens that two or three of them are killed at a shot. It is probable that in these contests the bird which comes off victorious takes possession of the female seraglio, as it is certain they have no faithful attachments.*

CHAPTER IX.

OF THE PARTRIDGE AND ITS VARIETIES.

THE Partridge may be particularly considered as belonging to the sportsman. It is a bird which even our laws have taken under protection, and like a peacock, or a hen, may be ranked as private property. The only difference now is, that we feed one in our farms, the other in our yards; that these are contented captives, those servants that have it in their power to change their master, by changing their habitation.

"These birds," says Willoughby, "hold the principal place in the feasts and entertainments of princes, without which their feasts are esteemed ignoble, vulgar, and of no account. The Frenchmen do so highly value, and are so fond of the partridge, that if they be wanting, they utterly slight and despise the best spread tables, as if there could be no feast without them." But however this might be in the times of our historian, the partridge is now too common in France to be considered as a delicacy, and this, as well as every other simple dish, is exploded for luxuries of a more compound invention.

In England, where the partridge is much scarcer, and a great deal dearer, it is still a favourite delicacy at the tables of the rich; and the desire of keeping it to themselves has induced them to make laws for its preservation, no way harmonizing with the general spirit of the English Legislation. What can be more arbitrary than to talk of preserving the game, which when defined, means no more than that the poor shall abstain from what the rich have taken a fancy to keep to themselves? If these birds could, like a cock or a hen, be made legal property, could they be taught to keep within certain districts and only feed on those grounds that belong to the man whose entertainments they improve, it then might, with some show of justice, be admitted, that as a man fed them, so he might claim them. But this is not the case; nor is it in any man's power to lay a restraint upon the liberty of these birds, that when let loose, put no limits to their excursions. They feed every where; upon every man's ground: and no man can say these birds are only fed by me. Those birds which are nourished by all, belong to all; nor can any one man, or any set of men, lay claim to them, when still continuing in a state of nature.

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* This account of the Cock of the Wood is taken from the Journal Œconomique, and may be relied on.

I never walked out about the environs of Paris, that I did not consider the immense quantity of game that was running almost tame on every side of me, as a badge of the slavery of the people; and what they wished me to observe as an object of triumph, I always regarded with a kind of secret compassion; yet this people have no game-laws for the remoter parts of the kingdom; the game is only preserved in a few places for the king, and is free in most places else. In England the prohibition is general, and the peasant has not a right to what even slaves, as he is taught to call them, are found to possess.

Of partridges there are two kinds, the gray and the red. The red partridge is the largest of the two, and often perches upon trees; the gray, with which we are best acquainted in England, is most prolific, and always keeps on the ground.

The partridge seems to be a bird well known all over the world, as it is found in every country, and in every climate; as well in the frozen regions about the pole, as the torrid tracts under the equator. It even seems to adapt itself to the nature of the climate where it resides In Greenland the partridge, which is brown in summer, as soon as the icy winter sets in, begins to take a covering suited to the season: it is then clothed with a warm down beneath, and its outward plumage assumes the colour of the snows amongst which it seeks its food. Thus it is doubly fitted for the place, by the warmth and the colour of its plumage; the one to defend it from the cold, the other to prevent its being noticed by the enemy. Those of Barakonda, on the other hand, are longer-legged, much swifter of foot, and choose the highest rocks and precipices to reside in.

They all, however, agree in one character, of being immoderately addicted to venery; and, as some writers affirm, often to an unnatural degree. It is certain the male will pursue the hen even to her nest, and will break her eggs, rather than not indulge his inclinations. Though the young ones have kept together in flocks during the winter, when they begin to pair in Spring, their society disperses, and combats, very terrible with respect to each other, ensue. Their manners, in other circumstances, resemble all those of poultry in general, but their cunning and instincts seem superior to those of the larger kinds Perhaps, as they live in the very neighbourhood of their enmies, they have more frequent occasion to put their little arts in practice, and learn by habit the means of evasion or safety. Whenever, therefore, a dog, or other formidable animal approaches their nest, the female uses every means to draw him away. She keeps just before him, pretends to be incapable of flying, just hops up, and then falls down before him, but never goes off so far as to discourage her pursuer. At length, when she has drawn him entirely away from her secret treasure, she at once takes wing, and fairly leaves him to gaze after her in despair.

After the danger is over, and the dog withdrawn, she then calls her young, who assemble at once at her cry, and follow where she leads them. There are generally from ten to fifteen in a covey; and, if unmolested, they live from fifteen to seventeen years.

There are several methods of taking them, as is well known; that by which they are taken in a net with a setting-dog, is the most pleasant as well as the most secure. The dog, as every body knows, is trained to this exercise, by a long course of education; by blows and caresses he is taught to lie down at the word of command; a partridge is shown him, and he is then ordered to lie down; he is brought into the field, and when the sportsman perceives where the covey lies, he orders his dog to crouch; at length the dog, from habit, crouches wherever he approaches a covey; and this is the signal which the sportsman receives for unfolding and covering the birds with his net. A covey, thus caught, is sometimes fed in a place proper for their reception; but they can never be thoroughly tamed, like the rest of our domestic poultry.

CHAPTER X.

THE QUAIL.

THE last of the poultry kind that I shall mention is the quail; a bird much smaller than any of the former, being not above half the size of a partridge. The feathers of the head are black, edged with rusty brown; the breast is of a pale yellowish red, spotted with black; the feathers on the back are marked with lines of a pale yellow, and the legs are of a pale hue. Except in the colours thus described, and the size, it every way resembles a partridge in shape; and except that it is a bird of passage, all others of the poultry kind, in its habits and nature.

The quail is by all known to be a bird of passage; and yet if we consider its heavy manner of flying, and its dearth of plumage, with respect to its corpulence, we shall be surprised how a bird so apparently ill qualified for migration, should take such extensive journeys. Nothing, however, is more certain. "When we sailed from Rhodes to Alexandria," says Bellonius, "about autumn, many quails flying from the north to the south, were taken in our ship; and sailing a spring-time the contrary way, from the south to the north, I observed them on their return, when many of them were taken in the same manner." This account is confirmed by many others, who aver, that they choose a north wind for these adventures; the south wind being very unfavourable, as it retards their flight, by moistening their plumage. They then fly two by two; continuing, when the way lies over land, to go faster by night than by day; and to fly very high, to avoid being surprised or set upon by birds of prey. However, it still remains a doubt whether quails take such long journeys as Bellonius has made them perform. It is now asserted by some, that the quail only migrates from one province of a country to another. For instance, in England they fly from the inland counties to those bordering on the sea, and continue there all the winter. If frost or snow drive them out of the stubble-fields or marshes, they then retreat to the sea-side, shelter themselves among the weeds, and live upon what is thrown up from the sea upon shore. Particularly in Essex, the time of their appearance upon the coasts of that country exactly coincides with their disappearnce from the more internal parts of the kingdom; so that what has been said of long flights, is probably not so well-founded as is generally supposed.

These birds are much less prolific than the partridge; seldom laying more than six or seven whitish eggs, marked with ragged, rust-coloured spots. But their ardour in courtship yields scarce to any other bird, as they are fierce and cruel at that season to each other, fighting most desperately, and (a punishment they richly deserve) being at that time very easily taken. Quail-fighting was a favourite amusement among the Athenians; they abstained from the flesh of this bird, deeming it unwholesome, supposing that it fed upon the white hellebore, but they reared great numbers of them for the pleasure of seeing them fight, and staked sums of money, as we do with regard to cocks, upon the success of the combat. Fashion, however, has at present changed with regard to this bird; we take no pleasure in its courage, but its flesh is considered as a very great delicacy.

Quails are easily caught by a call: the fowler, early in the morning, having spread his net, hides himself under it among the corn; he then imitates the voice of the female, with his quail-pipe, which the cock hearing, approaches with the utmost assiduity: when he has got under the net, the fowler then discovers himself, and terrifies the quail, who attempting to get away, entangles himself the more in the net, and is taken. The quail may thus very well serve to illustrate the old adage, that every passion, carried to an inordinate excess, will at last lead to ruin.

BOOK IV.

OF BIRDS OF THE PIE KIND.

CHAPTER I.

OF BIRDS OF THE PIE KIND IN GENERAL.

IN marshalling our army of the feathered creation, we have placed in the van a race of birds long bred to war, and whose passion is slaughter; in the centre we have placed the slow and heavy laden that are usually brought into the field to be destroyed; we now come to a kind of light infantry, that partake something of the spirit of the two former, and yet belonging to neither. In this class we must be content to marshal a numerous, irregular tribe, variously armed, with different pursuits, appetites, and manners; not formidably formed for war, and get generally delighting in mischief; not slowly and usefully obedient, and yet without any professed enmity to the rest of their fellow-tenants of air.

To speak without metaphor, under this class of birds we may arrange all that noisy, restless, chattering, teazing tribe that lies between the hen and the thrush, that, from the size of the raven to that of the wood-pecker, flutter round our habitations, and rather with the spirit of pilferers than of robbers, make free with the fruits of human industry.

Of all the other classes, this seems to be that which the least contributes to furnish out the pleasures, or supply the necessaries of man. The falcon hunts for him; the poultry tribe supplies him with luxurious food; and the little sparrow race delight him with the melody of their warblings. The crane kind make a studied variety in his entertainments; and the class of ducks are not only many of them delicate in their flesh, but extremely useful for their feathers. But in the class of the pie kind there are few, except the pigeon, that are any way useful. They serve rather to teaze man than to assist or amuse him. Like faithless servants, they are fond of his neighbourhood, because they mostly live by his labour; but their chief study is what they can plunder in his absence, while their deaths make no atonement for their depredation.

But though with respect to man, this whole class is rather noxious than beneficial, though he may consider them in this light as false noisy, troublesome neighbours, yet with respect to each other, no class of birds are so ingenious, so active, or so well fitted for society. Could we suppose a kind of morality among birds, we should find that these are by far the most industrious, the most faithful, the most constant, and the most connubial. The rapacious kinds drive out their young before they are fit to struggle with adversity; but the pie kind cherish their young to the last. The poultry class are faithless and promiscuous in their courtship; but these live in pairs, and their attachments are wholly confined to each other. The sparrow kind frequently overleap the bounds of Nature, and make illicit varieties; but these never. They live in harmony with each other; every species is true to its kind, and transmits an unpolluted race to posterity.

As other kinds build in rocks or upon the ground, the chief place where these build is in trees or bushes; the male takes his share of the labours of building the nest; and often relieves his mate in the duties of incubation. Both take this office by turns; and when the young are excluded, both are equally active in making them an ample provision.

They sometimes live in societies, and in these there are general laws observed, and a kind of republican form of government established among them. They watch not only for the general safety, but for that of every other bird of the grove. How often have we seen a fowler stealing in upon a flock of ducks, or wild geese, disturbed by the alarming note of a crow or a magpie: its single voice gave the whole thoughtless tribe warning, and taught them in good time to look to their safety.

Nor are these birds less remarkable for their instincts than their capacity for instruction. There is an apparent cunning or archness in the look of the whole tribe; and I have seen crows and ravens taught to fetch and carry with the docility of a spaniel. Indeed, it is often an exercise that, without teaching, all this tribe are but too fond of. Every body knows what a passion they have for shining substances, and such toys as some of us put a value upon. A whole family has been alarmed at the loss of a ring; every servant has been accused, and every creature in the house, conscious of their own innocence, suspected each other, when to the utter surprise of all, it has been found in the nest of a tame magpie or a jackdaw, that nobody had ever thought of.

However, as this class is very numerous, it is not to be supposed that the manners are alike in all. Some, such as the pigeon, are gentle and serviceable to man; others are noxious, capricious, and noisy. In a few general characters they all agree; namely, in having hoarse voices, slight active bodies, and a facility of flight that baffles even the boldest of the rapacious kinds in the pursuit. I will begin with those birds which most properly may be said to belong to this class, and go on till I finish with the pigeon, a harmless bird, that resembles this tribe in little else except their size, and that seems to be the shade uniting the pie and the sparrow kind into one general picture.

It is not to be expected that in this sketch of the great magazine of Nature, we can stop singly to contemplate every object. To describe the number that offers would be tedious, and the similitude that one bears to another would make the history disgusting. As a historian in relating the actions of some noble people does not stop to give the character of every private man in the army, but only of such as have been distinguished by their conduct, courage, or treachery; so should the historian of Nature only seize upon the most striking objects before him; and, having given one common account of the most remarkable, refer the peculiarities of the rest to their general description.

CHAPTER II.

OF THE RAVEN, THE CROW, AND THEIR AFFINITIES.

THE Raven, the Carrion-crow, and the Rook, are birds so well known, that a long description would but obscure our ideas of them. The Raven is the largest of the three, and distinguished from the rest not only by his size, but by his bill being somewhat more hooked than that of the rest. As for the carrion-crow and the rook, they so strongly resemble each other, both in make and size, that they are not easily distinguished asunder. The chief difference to be found between them lies in the bill of the rook, which by being frequently thrust into the ground to fetch out grubs and earth-worms, is bare of feathers as far as the eyes, and appears of a whitish colour. It differs also in the purple splendour or gloss of its feathers, which in the carrion-crow are of a more dirty black. Nor is it amiss to make these distinctions, as the rook has but too frequently suffered for its similitude to the carrion-crow; and thus a harmless bird, that feeds only upon insects and corn, has been destroyed for another that feeds upon carrion, and is often destructive among young poultry.

The manners of the raven and the carrion-crow are exactly similar; they both feed upon carrion; they fly only in pairs; and will destroy other birds if they can take them by surprise. But it is very different with the rook, the daw, and the Cornish chough, which may be all ranked in this order. They are sociable and harmless; they live only upon insects and grain; and wherever they are, instead of injuring other birds, they seem sentinels for the whole feathered creation. It will be proper, therefore, to describe these two sorts according to their respective appetites, as they have nothing in common but the very strong similitude they bear to each other in their colour and formation.

The raven is a bird found in every region of the world; strong and hardy, he is uninfluenced by the changes of the weather; and when other birds seem numbed with cold, or pining with famine, the raven is active and healthy, busily employed in prowling for prey, or sporting in the coldest atmosphere. As the heats at the line do not oppress him, so he bears the cold of the polar countries with equal indifference. He is sometimes indeed seen milk-white; and this maprobably be the effect of the rigorous climates of the north. It is most likely that this change is wrought upon him as upon most other animals in that part of the world where their robes, particularly in winter, assume the colour of the country where they inhabit. As in old age, when the natural heat decays, the hair grows grey, and at last white; so among these animals, the cold of the climate may produce a similar languishment of colour, and may shut up those pores that conveyed the tincturing fluids to the extremest parts of the body.

However this may be, white ravens are often shown among us, which I have heard some say, are rendered thus by art; and this we could readily suppose if they were as easily changed in their colour as they are altered in their habits and dispositions. A raven may be reclaimed to almost every purpose to which birds can be converted. He may be trained up for fowling like a hawk; he may be taught to fetch and carry like a spaniel; he may be taught to speak like a parrot; but the most extraordinary of all is, that he can be taught to sing like a man. I have heard a raven sing the Black Joke with great distinctness, truth, and humour.

Indeed, when the raven is taken as a domestic, he has many qualities that render him extremely amusing. Busy, inquisitive, and impudent, he goes every where, affronts and drives off the dogs, plays his pranks on the poultry, and is particularly assiduous in cultivating the good will of the cook-maid, who seems to be the favourite of the family. But then, with the amusing qualities of a favourite, he often also has the vices and defects. He is a glutton by nature, and a thief by habit. He does not confine himself to petty depredations on the pantry or the larder; he soars at more magnificent plunder; at spoils that he can neither exhibit nor enjoy; but which, like a miser, he rests satisfied with having the satisfaction of sometimes visiting and contemplating in secret. A piece of money, a tea-spoon, or a ring, are always tempting baits to his avarice; these he will slily seize upon, and, if not watched, will carry to his favourite hole.

In his wild state, the raven is an active and greedy plunderer. Nothing comes amiss to him; whether his prey be living or long dead it is all the same, he falls to with a voracious appetite; and when he has gorged himself, flies to acquaint his fellows that they may participate of the spoil. If the carcass be already in the possession of some more powerful animal, a wolf, a fox, or a dog, the raven sits at a little distance, content to continue a humble spectator till they have done. If in his flights he perceives no hopes of carrion, and his scent is so exquisite that he can smell it at a vast distance, he then contents himself with more unsavory food, fruits, insects, and the accidental dessert of a dunghill.

This bird chiefly builds its nest in trees, and lays five or six eggs of a pale green colour, marked with small brownish spots. They live sometimes in pairs, and sometimes they frequent, in great numbers, the neighbourhood of populous cities, where they are useful in devouring those carcasses that would otherwise putrefy and infect the air. They build in high trees or old towers, in the beginning of March, with us in England, and sometimes sooner, as the spring is more or less advanced for the season. But it is not always near towns that they fix their retreats; they often build in unfrequented places, and drive all other birds from their vicinity. They will not permit even their young to keep in the same district, but drive them off when they are sufficiently able to shift for themselves. Martin, in his description of the Western Isles, avers, that there are three little islands among the number, which are occupied by a pair of ravens each, that drive off all other birds with great cries and impetuosity.

Notwithstanding the injury these birds do in picking out the eyes of sheep and lambs, when they find them sick and helpless, a vulgar respect is paid them as being the birds that fed the prophet Elijah in the wilderness. This prepossession in favour of the raven is of very ancient date, as the Romans themselves, who thought the bird ominous, paid it, from motives of fear, the most profound veneration. One of these that had been kept in the temple of Castor, as Pliny informs us, flew down into the shop of a tailor, who took much delight in the visits of his new acquaintance. He taught the bird several tricks; but particularly to pronounce the name of the emperor Tiberius, and the whole royal family. The tailor was beginning to grow rich by those who came to see this wonderful raven, till an envious neighbour, displeased at the tailor's success, killed the bird, and deprived the tailor of his future hopes of fortune. The Romans, however, took the poor tailor's part; they punished the man who offered the injury, and gave the raven all the honours of a magnificent interment.

Birds in general live longer than quadrupeds; and the raven is said to be one of the most long-lived of the number. Hesiod asserts that a raven will live nine times as long as a man; but though this is fabulous, it is certain that some of them have been known to live near a hundred years. This animal seems possessed of those qualities that generally produce longevity, a good appetite, and great exercise. In clear weather, the ravens fly in pairs to a great height, making a deep loud noise, different from that of their usual croaking.

The carrion-crow resembles the raven in its appetites, its laying, and manner of bringing up its young. It only differs in being less bold, less docile, and less favoured by mankind.

The rook leads the way in another, but a more harmless train, that have no carnivorous appetites, but only feed upon insects and corn. The Royston crow is about the size of the two former. The breast, belly, back, and upper part of the neck, being of a pale ash colour; the head and wings glossed over with a fine blue. He is a bird of passage, visiting this kingdom in the beginning of winter, and leaving it in the spring. He breeds, however, in different parts of the British dominions; and his nest is common enough in trees in Ireland. The jackdaw is black, like all the former, but ash-coloured on the breast and belly. He is not above the size of a pigeon. He is docile and loquacious. His head being large for the size of his body, which, as has been remarked, argues him ingenious and crafty. He builds in steeples, old castles, and high rocks, laying five or six eggs in a season. The Cornish chough is like a jackdaw, but bigger, and almost the size of a crow. The feet and legs are long, like those of a jackdaw, but of a red colour, and the plumage is black all over. It frequents rocks, old castles, and churches by the sea-side, like the daw, and with the same noisy assiduity. It is only seen along the western coasts of England. These are birds very similar in their manners, feeding on grain and insects, living in society, and often suffering general castigation from the flock for the good of the community.

The rook, as is well known, builds in woods and forests in the neighbourhood of man, and sometimes makes choice of groves in the very midst of cities for the place of its retreat and security. In these it establishes a kind of legal constitution, by which all intruders are excluded from coming to live among them, and none suffered to build but acknowledged natives of the place. I have often amused myself with observing their plan of policy from my window in the Temple, that looks upon a grove where they have made a colony in the midst of the city. At the commencement of spring, the rookery, which, during the continuance of winter, seemed to have been deserted, or only guarded by about five or six, like old soldiers in a garrison, now begins to be once more frequented, and in a short time all the bustle of business is fairly commenced. Where these numbers resided during the winter is not easy to guess; perhaps in the trees of hedgerows, to be nearer their food. In spring, however, they cultivate their native trees; and, in the places where they were themselves hatched, they prepare to propagate a future progeny.

They keep together in pairs; and when the offices of courtship are over, they prepare for making their nests and laying. The old inhabitants of the place are all already provided; the nest which served them for years before, with a little trimming and dressing, will serve very well again; the difficulty of nestling lies only upon the young ones who have no nest, and must therefore get up one as well as they can. But not only the materials are wanting, but also the place in which to fix it. Every part of a tree will not do for this purpose, as some branches may not be sufficiently forked; others may not be sufficiently strong; and still others may be too much exposed to the rockings of the wind. The male and female upon this occasion are, for some days, seen examining all the trees of the grove very attentively; and when they have fixed upon a branch that seems fit for their purpose, they continue to sit upon, and observe it very sedulously for two or three days longer. The place being thus determined upon, they begin to gather the materials for their nest; such as sticks and fibrous roots, which they regularly dispose in the most substantial manner. But here a new and unexpected obstacle arises. It often happens that the young couple have made choice of a place too near the mansion of an older pair, who do not choose to be incommoded by such troublesome neighbours. A quarrel therefore instantly ensues, in which the old ones are always victorious.

The young couple, thus expelled, are obliged again to go through the fatigues of deliberating, examining, and choosing: and having taken care to keep their due distance, the nest begins again, and their industry deserves commendation. But their alacrity is often too great in the beginning; they soon grow weary of bringing the materials of their nest from distant places, and they very easily perceive that sticks may be provided nearer home, with less honesty, indeed, but some degree of address. Away they go, therefore, to pilfer, as fast as they can; and wherever they see a nest unguarded, they take care to rob it of the choicest sticks of which it is composed. But these thefts never go unpunished; and probably upon complaint being made, there is a general punishment inflicted. I have seen eight or ten rooks come upon such occasions, and setting upon the new nest of the young couple all at once, tear it in pieces in a moment.

At length, therefore, the young pair find the necessity of going more regularly and honestly to work. While one flies to fetch the materials, the other sits upon the tree to guard it; and thus in the space of three or four days, with a skirmish now and then between, the pair have fitted up a commodious nest composed of sticks without, and of fibrous roots and long grass within. From the instant the female begins to lay, all hostilities are at an end; not one of the whole grove, that a little before treated her so rudely, will now venture to molest her; so that she brings forth her brood with patient tranquillity. Such is the severity with which even native rooks are treated by each other; but if a foreign rook should attempt to make himself a denizen of their society, he would meet with no favour; the whole grove would at once be up in arms against him, and expel him without mercy.

In some countries these birds are considered as a benefit, in others as a nuisance: their chief food is the worm of the dor-beetle, and corn; thus they may be said to do as much service by destroying that noxious insect, as they do injury by consuming the produce of the husbandman's industry.

To this tribe of the crow-kind, some foreign sorts might be added: I will take notice only of one, which, from the extraordinary size and fashion of its bill, must not be passed in silence. This is the Calao, or horned Indian raven, which exceeds the common raven in size and habits of depredation. But what he differs in from all other birds is the beak, which by its length and curvature at the end, appears designed for rapine; but then it has a kind of horn standing out from the top, which looks somewhat like a second bill, and gives this bird, otherwise fierce and ugly, a very formidable appearance. The horn springs out of the forehead, and grows to the upper part of the bill, being of great bulk; so that near the forehead it is four inches broad, not unlike the horn of the rhinoceros, but more crooked at the tip. Were the body of the bird answerable in size to the head, the calao would exceed in magnitude even the vulture or the eagle. But the head and beak are out of all proportion, the body being not much larger than that of a hen. Yet even here there are varieties; for in such of those birds as come from different parts of Africa, the body is proportionable to the beak; in such as come from the Molucca Islands, the beak bears no proportion to the body. Of what use this extraordinary excrescence is to the bird, is not easy to determine; it lives, like others of its kind, upon carrion, and seldom has a living enemy to cope with. Nature seems to sport in the production of many animals, as if she were willing to exhibit instances as well of variety as economy in their formation.

CHAPTER III.

OF THE MAGPIE AND ITS AFFINITIES.

THERE are such a variety of birds that may be distributed under this head, that we must not expect very precise ideas of any. To have a straight strong bill, legs formed for hopping, a body of about the size of a magpie, and party-coloured plumage, are the only marks by which I must be contented to distinguish this numerous fantastic tribe that add to the beauty, though not to the harmony of our landscapes. In fact, their chattering every where disturbs the melody of the lesser warblers; and their noisy courtship not a little damps the song of the linnet and the nightingale.

However, we have very few of this kind in our woods compared to those in the neighbourhood of the line. There they not only paint the scene with the beauty and the variety of their plumage, but stun the ear with vociferation. In those luxurious forests, the singing birds are scarce ever heard, but a hundred varieties of the pie, the jay, the roller, the chatterer, and the toucan, are continually in motion, and with their illusive mockeries disturb or divert the spectators, as he happens to be disposed.

The magpie is the chief of this kind with us, and is too well known to need a description. Indeed, were its other accomplishments equal to its beauty, few birds could be put in competition. Its black, its white, its green, and purple, with rich and gilded combination of the glosses on its tail, are as fine as any that adorn the most beautiful of the feathered tribe. But it has too many of the qualities of a beau to depreciate these natural perfections: vain, restless, loud, and quarrelsome, it is an unwelcome intruder every where, and never misses an opportunity when it finds one, of doing mischief.

The magpie bears a great resemblance to the butcher-bird in its bill, which has a sharp process near the end of the upper chap, as well as in the shortness of its wings, and the form of the tail, each feather shortening from the two middlemost. But it agrees still more in its food, living not only upon worms and insects, but also upon small birds when they can be seized. A wounded lark, or a young chicken separated from the hen, are sure plunder; and the magpie will even sometimes set upon and strike a blackbird.

The same insolence prompts it to teaze the largest animals when its insults can be offered with security. They often are seen perched upon the back of an ox or a sheep, pecking up the insects to be found there, chattering and tormenting the poor animal at the same time, and stretching out their necks for combat, if the beast turns its head backward to reprehend them. They seek out also the nests of birds, and if the parent escapes, the eggs make up for the deficiency

The thrush and the blackbird are but too frequently robbed by this assassin, and this in some measure causes their scarcity.

No food seems to come amiss to this bird; it shares with ravens in their carrion, with rooks in their grain, and with the cuckoo in birds' eggs.: but it seems possessed of a providence seldom usual with gluttons; for when it is satisfied for the present, it lays up the remainder of the feast for another occasion. It will, even in a tame state, hide its food when it has done eating, and after a time return to the secret hoard with renewed appetite and vociferation.

In all its habits it discovers a degree of instinct unusual to other birds. Its nest is not less remarkable for the manner in which it is composed, than for the place the magpie takes to build it in. The nest is usually placed conspicuous enough, either in the middle of some hawthorn bush, or on the top of some high tree. The place however, is always found difficult of access; for the tree pitched upon usually grows in some thick hedge-row, fenced by brambles at the root, or sometimes one of the higher bushes is fixed upon for the purpose. When the place is thus chosen as inaccessible as possible to men, the next care is to fence the nest above so as to defend it from all the various enemies of air. The kite, the crow, and the sparrow-hawk, are to be guarded against, as their nests have been sometimes plundered by the magpie, so it is reasonably feared that they will take the first opportunity to retaliate. To prevent this, the magpie's nest is built with surprising labour and ingenuity.

The body of the nest is composed of hawthorn branches, the thorns sticking outward, but well united together by their mutual insertions. Within it is lined with fibrous roots, wool, and long grass, and then nicely plastered all round with mud and clay. The body of the nest being thus made firm and commodious, the next work is to make the canopy which is to defend it above. This is composed of the sharpest thorns, wove together in such a manner as to deny all entrance except at the door, which is just large enough to permit egress and regress to the owners. In this fortress the male and female hatch and bring up their brood with security, sheltered from all attacks but those of the climbing schoolboy, who often finds his torn and bloody hands too dear a price for the eggs or the young ones. The magpie lays six or seven eggs, of a pale green colour, spotted with brown.

This bird, in its domestic state, preserves its natural character with strict propriety. The same noisy mischievous habits attend it to the cage that marked it in the woods, and being more cunning, so it is also a more docile bird than any other taken into keeping. Those who are desirous of teaching it to speak, have a foolish custom of cutting its tongue, which only puts the poor animal to pain, without improving its speech in the smallest degree. Its speaking is sometimes very distinct, but its sounds are too thin and sharp to be an exact imitation of the human voice, which the hoarse raven and parrot can counterfeit more exactly.

To this tribe we may refer the Jay, which is one of the most beautiful of the British birds. The forehead is white, streaked with black; the head is covered with very long feathers, which it can erect into a crest at pleasure; the whole neck, back, breast, and belly are of a faint purple, dashed with gray; the wings are most beautifully barred with a lovely blue, black, and white: the tail is black, and the feet of a pale brown. Like the magpie, it feeds upon fruits, will kill small birds, and is extremely docile.

The Chatterer also, which is a native of Germany, may be placed in this rank, and is somewhat less than the former. It is variegated with a beautiful mixture of colours, red, ash-colour, chesnut, and yellow; but what distinguishes it from all other birds, are the horny appendages from the tips of seven of the lesser quill feathers, which stand bare of beards, and have the colour and gloss of the best red sealing-wax.

The Roller is not less beautiful than any of the former. The breast and belly are blue; the head green; and the wings variegated with blue, black, and white. But it may be distinguished from all others by a sort of naked tubercles or warts near the eyes, which still further contribute to increase its beauty.

To this class may be added a numerous list from all the tropical forests of the east and west, where the birds are remarkable for discordant voices and brilliant plumage. I will fix only upon one, which is the most singular of all the feathered creation. This is the Toucan, a bird of the pie kind, whose bill is nearly as large as the rest of its whole body.

Of this extraordinary bird there are four or five varieties. I will only describe the red-beaked toucan; and as the figure of this bird makes the principal part of its history, I will follow Edwards through all the minutiæ of its singular conformation. It is about the size of and shaped like a jackdaw, with a large head to support its monstrous bill. This bill, from the angles of the mouth to its point, is six inches and a half, and its breadth, in the thickest part, is a little more than two. Its thickness near the head is one inch and a quarter; and it is a little rounded along the top of the upper chap, the under side being round also; the whole of the bill extremely slight, and a little thicker than parchment. The upper chap is of a bright yellow, except on each side, which is of a fine scarlet colour; as is also the lower chap, except at the base, which is purple. Between the head and the bill there is a black line of separation all round the base of the bill, in the upper part of which the nostrils are placed, and are almost covered with feathers, which has occasioned some writers to say, that the toucan has no nostrils. Round the eyes, on each side of the head, is a space of bluish skin, void of feathers, above which the head is black, except a white spot on each side joining to the base of the upper chap. The hinder part of the neck, the back, wings, tail, belly, and thighs, are black. The under side of the head, throat, and the beginning of the breast, are white. Between the white on the breast, and the black on the belly, is a space of red feathers in the form of a new moon, with its horns upwards. The legs, feet, and claws, are of an ash-colour, and the toes stand like those of the parrot, two before, and two behind.

It is reported by travellers, that this bird, though furnished with so formidable a beak, is harmless and gentle, being so easily made tame, as to sit and hatch its young in houses. It feeds chiefly upon pepper, which it devours very greedily, gorging itself in such a manner, that it voids it crude and unconcocted. This, however, is no objection to the natives using it again; they even prefer it before that pepper which is fresh gathered from the tree, and seem persuaded that the strength and heat of the pepper is qualified by the bird, and that all its noxious qualities are thus exhausted.

Whatever be the truth of this report, nothing is more certain than that the toucan lives only upon a vegetable diet; and in a domestic state, to which it is frequently brought in the warm countries where it is bred, it is seen to prefer such food to all other. Pozzo, who bred one tame, asserts, that it leaped up and down, wagged the tail, and cried with a voice resembling that of a magpie. It fed upon the same things that parrots do, but was most greedy of grapes, which being plucked off one by one, and thrown into the air, it would most dexterously catch before they fell to the ground. Its bill, he adds, was hollow, and upon that account very light, so that it had but little strength in so apparently formidable a weapon; nor could it peck or strike smartly therewith. But its tongue seemed to assist the efforts of this unwieldy machine: it was long, thin, and flat, not unlike one of the feathers on the neck of a dunghill cock; this it moved up and down, and often extended five or six inches from the bill. It was of a flesh colour, and very remarkably fringed on each side with very small filaments, exactly resembling a feather.

It is probable that this long tongue has greater strength than the thin hollow beak that contains it. It is likely that the beak is only a kind of sheath for this peculiar instrument, used by the toucan, not only in making itself a nest, but also in obtaining its provision. Nothing is more certain than that this bird builds its nest in holes of trees, which have been previously scooped out for this purpose, and it is not very likely that so feeble a bill could be very serviceable in working upon such hard materials.

Be this as it will, there is no bird secures its young better from external injury than the toucan. It has not only birds, men, and serpents to guard against, but a numerous tribe of monkeys, still more preying, mischievous, and hungry than all the rest. The toucan, however, scoops out its nest in the hollow of some trees, leaving only a hole large enough to go in and out at. There it sits, with its great beak, guarding the entrance, and if the monkey ventures to offer a visit of curiosity, the toucan gives him such a welcome, that he presently thinks proper to pack off, and is glad to escape with safety.

This bird is only found in the warm climates of South America, where it is in great request, both for the delicacy of its flesh, which is tender and nourishing, and for the beauty of its plumage, particularly the feathers of the breast. The skin of this part the Indians pluck off, and when dry, glue to their cheeks, and this they consider as an irresistible addition to their beauty.

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The Roller is not less beautiful than any of the former. The breast and belly are blue; the head green; and the wings variegated with blue, black, and white. But it may be distinguished from all others by a sort of naked tubercles or warts near the eyes, which still further contribute to increase its beauty.

To this class may be added a numerous list from all the tropical forests of the east and west, where the birds are remarkable for discordant voices and brilliant plumage. I will fix only upon one, which is the most singular of all the feathered creation. This is the Toucan, a bird of the pie kind, whose bill is nearly as large as the rest of its whole body

Of this extraordinary bird there are four or five varieties. I will only describe the red-beaked toucan; and as the figure of this bird makes the principal part of its history, I will follow Edwards through all the minutiæ of its singular conformation. It is about the size of and shaped like a jackdaw, with a large head to support its monstrous bill. This bill, from the angles of the mouth to its point, is six inches and a half, and its breadth, in the thickest part, is a little more than two. Its thickness near the head is one inch and a quarter; and it is a little rounded along the top of the upper chap, the under side being round also; the whole of the bill extremely slight, and a little thicker than parchment. The upper chap is of a bright yellow, except on each side, which is of a fine scarlet colour; as is also the lower chap, except at the base, which is purple. Between the head and the bill there is a black line of separation all round the base of the bill, in the upper part of which the nostrils are placed, and are almost covered with feathers, which has occasioned some writers to say, that the toucan has no nostrils. Round the eyes, on each side of the head, is a space of bluish skin, void of feathers, above which the head is black, except a white spot on each side joining to the base of the upper chap. The hinder part of the neck, the back, wings, tail, belly, and thighs, are black. The under side of the head, throat, and the beginning of the breast, are white. Between the white on the breast, and the black on the belly, is a space of red feathers in the form of a new moon, with its horns upwards. The legs, feet, and claws, are of an ash-colour, and the toes stand like those of the parrot, two before, and two behind.

It is reported by travellers, that this bird, though furnished with so formidable a beak, is harmless and gentle, being so easily made tame, as to sit and hatch its young in houses. It feeds chiefly upon pepper, which it devours very greedily, gorging itself in such a manner, that it voids it crude and unconcocted. This, however. is no objection to the natives using it again; they even prefer it before that pepper which is fresh gathered from the tree, and seem persuaded that the strength and heat of the pepper is qualified by the bird, and that all its noxious qualities are thus exhausted.

Whatever be the truth of this report, nothing is more certain than that the toucan lives only upon a vegetable diet; and in a domestic state, to which it is frequently brought in the warm countries where it is bred, it is seen to prefer such food to all other. Pozzo, who bred one tame, asserts, that it leaped up and down, wagged the tail, and cried with a voice resembling that of a magpie. It fed upon the same things that parrots do, but was most greedy of grapes, which being plucked off one by one, and thrown into the air, it would most dexterously catch before they fell to the ground. Its bill, he adds, was hollow, and upon that account very light, so that it had but little strength in so apparently formidable a weapon; nor could it peck or strike smartly therewith. But its tongue seemed to assist the efforts of this unwieldy machine: it was long, thin, and flat, not unlike one of the feathers on the neck of a dunghill cock; this it moved up and down, and often extended five or six inches from the bill. It was of a flesh colour, and very remarkably fringed on each side with very small filaments, exactly resembling a feather.

It is probable that this long tongue has greater strength than the thin hollow beak that contains it. It is likely that the beak is only a kind of sheath for this peculiar instrument, used by the toucan, not only in making itself a nest, but also in obtaining its provision. Nothing is more certain than that this bird builds its nest in holes of trees, which have been previously scooped out for this purpose, and it is not very likely that so feeble a bill could be very serviceable in working upon such hard materials.

Be this as it will, there is no bird secures its young better from external injury than the toucan. It has not only birds, men, and serpents to guard against, but a numerous tribe of monkeys, still more preying, mischievous, and hungry than all the rest. The toucan, however, scoops out its nest in the hollow of some trees, leaving only a hole large enough to go in and out at. There it sits, with its great beak, guarding the entrance, and if the monkey ventures to offer a visit of curiosity, the toucan gives him such a welcome, that he presently thinks proper to pack off, and is glad to escape with safety.

This bird is only found in the warm climates of South America, where it is in great request, both for the delicacy of its flesh, which is tender and nourishing, and for the beauty of its plumage, particularly the feathers of the breast. The skin of this part the Indians pluck off, and when dry, glue to their cheeks, and this they consider as an irresistible addition to their beauty.

CHAPTER IV.

OF THE WOODPECKER AND ITS AFFINITIES.

We now come to the numerous tribes of Woodpeckers, a class easily distinguished from all others, both for their peculiar formation, their method of procuring food, and their manner of providing a place of safety for their young. Indeed, no other class of birds seems more immediately formed for the method of life they pursue, being fitted by nature, at all points, for the peculiarity of their condition. They live chiefly upon the insects contained in the body of trees; and for this purpose are furnished with a straight, hard, strong, angular, and sharp bill, made for piercing and boring. They have a tongue of a very great length; round, ending in a sharp, stiff, bony thorn, dentated on each side, to strike ants and insects when dislodged from their cells Their legs are short and strong, for the purposes of climbing. Their toes stand two forward, and two backward; which is particularly serviceable in holding by the branches of trees. They have hard stiff tails to lean upon when climbing. They feed only upon insects, and want that intestine, which naturalists call the *cæcum;* a circumstance peculiar to this tribe only.

Of this bird there are many kinds, and many varieties in each kind. They form large colonies in the forests of every part of the world. They differ in size, colour, and appearance; and agree only in the marks above-mentioned, or in those habits which result from so peculiar a conformation. Instead, therefore, of descending into a minute discrimination of every species, let us take one for a pattern, to which all the rest will be found to bear the strongest affinity. Words can but feebly describe the plumage of a bird, but it is the province of history to enter into a detail of every animal's pursuits and occupations.

The Green Woodspite, or Woodpecker, is called the *rain-fowl* in some parts of the country; because when it makes a greater noise than ordinary, it is supposed to fortel rain. It is about the size of a jay; the throat, breast, and belly are of a pale greenish colour; and the back, neck, and covert feathers of the wings are green. But the tongue of this little animal makes its most distinguished characteristic, as it serves for its support and defence. As was said above, the woodpecker feeds on insects, and particularly on those which are lodged in the body of hollow or of rotten trees. The tongue is its instrument for killing and procuring this food, which cannot be found in great plenty. This is round, ending in a stiff, sharp, bony tip, dentated on both sides, like the beard of an arrow; and this it can dart out three or four inches from the bill, and draw in again at pleasure. Its prey is thus transfixed, and drawn into the bill, which, when swallowed, the dart is again launched at fresh game. Nothing has employed the attention of the curious in this part of anatomy, more than the contrivance by which the tongue of this bird performs its functions with such great celerity. The tongue is drawn back into the bill by the help of two small round cartilages, fastened into the fore-mentioned bony tip, and running along the length of the tongue. These cartilages, from the root of the tongue, take a circuit beyond the ears, and being reflected backwards to the crown of the head, make a large bow. The muscular spongy flesh of the tongue incloses these cartilages, like a sheath, and is so made that it may be extended or contracted like a worm. The cartilages, indeed, have muscles accompanying them along their whole length backwards.—But there is still another contrivance, for there is a broad muscle joining the cartilages to the bones of the skull, which, by contracting or dilating, forces the cartilages forward through the tongue, and then forces the tongue and all through the bill, to be employed for the animal's preservation in piercing its prey.

Such is the instrument with which this bird is provided, and this the manner in which this instrument is employed. When a woodpecker, by its natural sagacity, finds out a rotten hollow tree, where there are worms, ants' eggs, or insects, it immediately prepares for its operations. Resting by its strong claws, and leaning on the thick feathers of its tail, it begins to bore with its sharp strong beak, until it discloses the whole internal habitation. Upon this, either through pleasure at the sight of its prey, or with a desire to alarm the insect colony, it sends forth a loud cry, which throws terror and confusion into the whole insect tribe. They creep hither and thither, seeking for safety, while the bird luxuriously feasts upon them at leisure, darting its tongue with unerring certainty, and devouring the whole brood.

The woodpecker, however, does not confine its depredations solely to trees, but sometimes lights upon the ground, to try its fortune at an ant-hill. It is not so secure of prey there as in the former case, although the numbers are much greater. They lie generally too deep for the bird to come at them, and it is obliged to make up by stratagem the defects of power. The woodpecker first goes to their hills, which it pecks, in order to call them abroad; it then thrusts out its long red tongue, which being like a worm, and resembling their usual prey, the ants come out to settle upon it in great numbers; however, the bird watching the properest opportunity, withdraws its tongue at a jerk, and devours the devourers. This stratagem it continues till it has alarmed their fears, or till it is quite satisfied.

As the woodpecker is obliged to make holes in trees to procure food, so is it also to make cavities still larger to form its nest and to lay in. This is performed, as usual, with the bill, although some have affirmed that the animal uses its tongue as a gimblet to bore with.—But this is a mistake, and those that are curious may often hear the noise of the bill making its way in large woods and forests. The woodpecker chooses, however, for this purpose, trees that are decayed, or wood that is soft, like beech, elm, and poplar. In these, with very little trouble, it can make holes as exactly round as a mathematician could with compasses. One of these holes the bird generally chooses for its own use, to nestle and bring up its young in; but as they are easily made, it is delicate in its choice, and often makes twenty before one is found fit to give entire satisfaction. Of those which it has made and deserted, other birds, not so good borers, and less delicate in their choice, take possession. The jay and the starling lay their eggs in these holes, and bats are now and then found in peaceable possession. Boys sometimes have thrust in their hands with certain hopes of plucking out a birds's egg; but to their great mortification, have had their fingers bitten by a bat at the bottom.

The woodpecker takes no care to line its nest with feathers or straw; its eggs are deposited in the hole, without any thing to keep them warm except the heat of the parent's body. Their number is generally five, or six; always white, oblong, and of a middle size. When the young are excluded, and before they leave the nest, they are adorned with a scarlet plumage under the throat, which adds to their beauty.

In our climate, this bird is contented with such a wainscot habitation as has been described for its young; but in the warmer regions of Guinea and Brazil, they take a very different method to protect and hatch their nascent progeny. A traveller who walks into the forests of those countries, among the first strange objects that excite curiosity, is struck with the multitude of birds' nests hanging at the extremity of almost every branch. Many other kind of birds build in this manner, but the chief of them are of the woodpecker kind; and indeed, there is not, in the whole history of Nature, a more singular instance of the sagacity of those little animals in protecting themselves against such enemies as they have most occasion to fear. In cultivated countries, a great part of the caution of the feathered tribe is to hide or defend their nests from the invasions of man, as he is their most dreaded enemy. But in the depth of those remote and solitary forests, where man is but seldom seen, the little bird has nothing to apprehend from man. The parent is careless how much the nest is exposed to general notice, satisfied if it be out of the reach of those rapacious creatures that live by robbery and surprise. If the monkey or the snake can be guarded against, the bird has no other enemies to fear: for this purpose its nest is built upon the depending points of the most outward branches of a tall tree, such as the banana or the plantain. On one of those immense trees is seen the most various, and the most inimical assemblage of creatures that can be imagined. The top is inhabited by monkeys of some particular tribe, that drive off all others; lower down twine about the great trunk numbers of the larger snakes, patiently waiting till some unwary animal comes within the sphere of their activity, and at the edges of the tree hang these artificial nests, in great abundance, inhabited by birds of the most delightful plumage.

The nest is usually formed in this maner: When the time of incubation approaches, they fly busily about, in quest of a kind of moss, called by the English inhabitants of those countries *old man's beard*. It is a fibrous substance, and not very unlike hair, which bears being moulded into any form, and suffers being glued together. This therefore the little woodpecker, called by the natives of Brazil. the *guira, tenga*, first glues by some viscous substance, gathered in the forest, to the extremest branch of a tree; then building downward, and still adding fresh materials to those already procured, a nest is formed,

Parakeets, p. 127.

Parrot, p. 126.

Hoopoe, p. 114.

Macaw, p. 127.

Redbreast, p. 142.

To face p. 120 vol. iii.

Humming Bird, p. 156.

Golden-crested Wren, p. 142.

Humming Birds, p. 156.

To face p. 121, vol. iii.

that depends like a pouch from the point of the branch. the hole to enter at, is on the side; and all the interior parts are lined with the finer fibres of the same substance, which compose the whole. Such is the general contrivance of these hanging nests, which are made by some other birds with still superior art. A little bird of the Grosbeak kind, in the Philippine islands makes its nest in such a manner that there is no opening but from the bottom. At the bottom the bird enters, and goes up through a funnel like a chimney, till it comes to the real door of the nest, which lies on one side, and only opens into this funnel.

Some birds glue their nest to the leaf of the banana-tree, which makes two sides of their little habitation, while the other two are artificially composed by their own industry. But these, and all of the kind, are built with the same precautions to guard the young against the depredations of monkeys and serpents, which abound in every tree. The nest hangs there, before the spoilers, a tempting object, which they can only gaze upon, while the bird flies in and out, without danger or molestation from so formidable a vicinity

CHAPTER V.

OF THE BIRD OF PARADISE AND ITS VARIETIES.

THERE are few birds that have more deceived and puzzled the learned than this. Some have described it as an inhabitant of the air, living only upon the dew of heaven, and never resting below; others have acquiesced in the latter part of its history, but have given it flying insects to feed on. Some have asserted that it was without feet and others have ranked it among the birds of prey.

The great beauty of this bird's plumage, and the deformity of its legs, seem to have given rise to most of these erroneous reports. The native savages of the Molucca Islands, of which it is an inhabitant, were very little studious of natural history; and perceiving the inclination the Europeans had for this beautiful bird, carefully cut off its legs before they brought it to market; thus concealing its greatest deformity, they considered themselves entitled to rise in their demands when they offered it for sale. One deceit led on another; the buyer finding the bird without legs, naturally inquired after them; and the seller as naturally began to assert that it had none. Thus far the European was imposed upon by others; in all the rest he imposed upon himself. Seeing so beautiful a bird without legs, he concluded that it could live only in air, where legs were unnecessary. The extraordinary splendour of its plumage assisted this deception, and as it had heavenly beauty, so it was asserted to have a heavenly residence. From thence its name, and all the false reports that have been propagated concerning it.

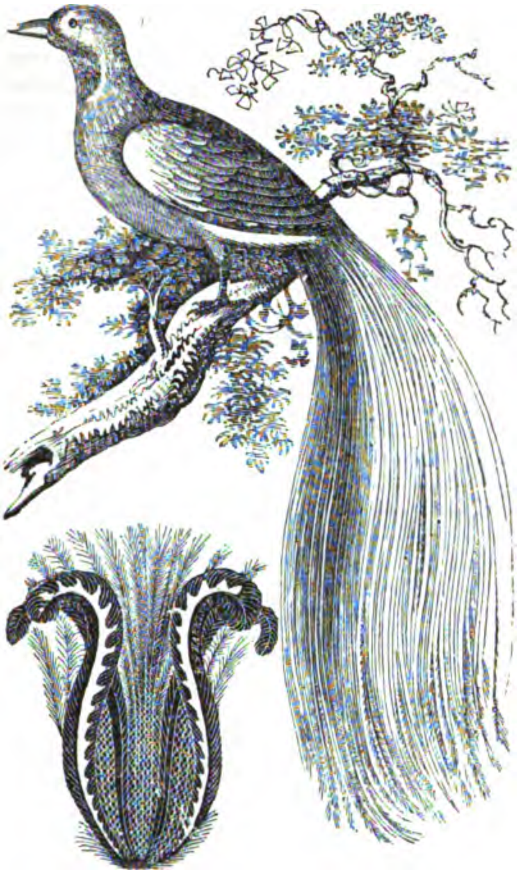
Error, however, is short-lived, and time has discovered that this bird not only has legs, but very large strong ones for its size. Credulity, when undeceived, runs into the opposite extreme, and soon after this harmless bird was branded with the character of being rapacious, of destroying all those of smaller size, and from the amazing rapidity of its flight, as qualified peculiarly for extensive rapine. The real history of this pretty animal is at present tolerably well known, and it is found to be as harmless as it is beautiful.

There are two kinds of the bird of Paradise; one about the size of a pigeon, which is more common; the other not much larger than a lark, which has been described more imperfectly. They are both sufficiently distinguished from all others, not only by the superior vivacity of their tints, but by the feathers of the tail, there being two long slender filaments growing from the upper part of the rump, these are longer than the bird's body, and bearded only at the end. By this mark the bird of Paradise may be easily known, but still more easily by its gaudy livery, which being so very brilliant, demands to be minutely described.

This bird appears to the eye as large as a pigeon, though in reality the body is not much greater than that of a thrush. The tail, which is about six inches, is as long as the body; the wings are large, compared with the bird's other dimensions. The head, the throat, and the neck are of a pale gold colour. The base of the bill is surrounded by black feathers, as also the side of the head and throat, as soft as velvet, and changeable like those on the neck of a mallard. The hinder part of the head is of a shining green, mixed with gold. The body and wings are chiefly covered with beautiful brown, purple, and gold feathers. The uppermost part of the tail feathers are of a pale yellow, and those under them white and longer than the former, for which reason the hinder part of the tail appears to be all white. But what chiefly excites curiosity are the two long naked feathers abovementioned, which spring from the upper part of the rump above the tail, and which are usually about three feet long. These are bearded only at the beginning and the end; the whole shaft, for above two feet nine inches, being of a deep black, while the feathered extremity is of a changeable colour, like the mallard's neck.

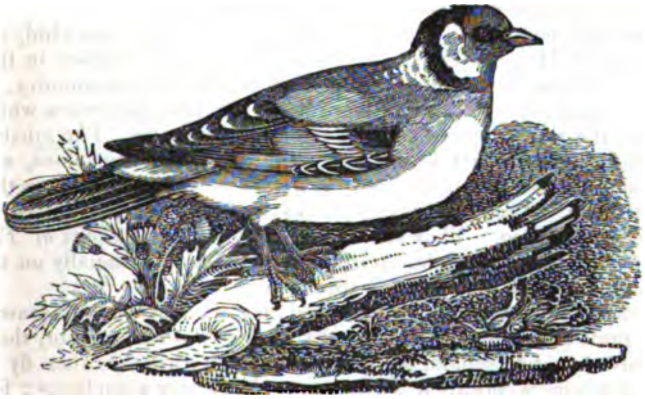
This bird, which for beauty exceeds all others of the pie kind, is a native of the Molucca Islands, but found in greatest numbers in that of Aro. There, in the delightful and spicy woods of the country, do these beautiful creatures fly in large flocks, so that the groves which produce the richest spices produce the finest birds also. The inhabitants themselves are not insensible of the pleasure these afford, and give them the name of God's birds, as being superior to all others that he has made. They live in large flocks, and at night generally perch upon the same tree. They are called by some, the *swallows of Ternate*, from their rapid flight, and from their being continually on the wing in pursuit of insects, their usual prey.

As the country where they are bred has its tempestuous season, when rains and thunders continually disturb the atmosphere, these birds are then but seldom seen. It is thought that they then fly to other countries where their food appears in greater abundance; for, like swallows, they have their stated times of return. In the begin-



Tail of Lyre Bird.

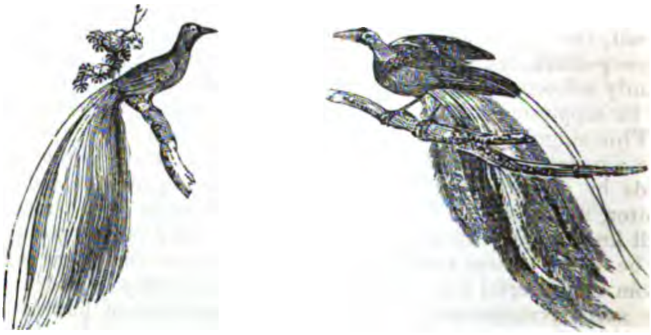
Great Bird of Paradise, p. 121.



Goldfinch. p. 141.

To face p. 122, vol. iii.

Lyre Bird, (variety of the Bird of Paradise), p. 121.



Varieties of the Bird of Paradise, p. 121.

To face p. 123, vol. iii.

ning of the month of August they are seen in great numbers flying together, and as the inhabitants would have us believe, following their king, who is distinguished from the rest by the lustre of his plumage, and that respect and veneration which is paid him. In the evening they perch upon the highest trees of the forest, particularly one which bears a red berry, upon which they sometimes feed, when other food fails them. In what manner they breed, or what may be the number of their young, as yet remains for discovery.

The natives, who make a trade of killing and selling these birds to the Europeans, generally conceal themselves in the trees where they resort, and having covered themselves up from sight in a bower made of the branches, they shoot at the birds with reedy arrows, and, as they assert, if they happen to kill the king, they then have a good chance for killing the greatest part of the flock. The chief mark by which they know the king is by the ends of the feathers in his tail, which have eyes like those of a peacock. When they have taken a number of these birds, their usual method is to gut them, and cut off their legs; they then run a hot iron into the body, which dries up the internal moisture, and filling the cavity with salts and spices, they sell them to the Europeans for a perfect trifle.

CHAPTER VI.

THE CUCKOO AND ITS VARIETIES.

FROM a bird of which many fables have been reported, we pass to another that has not given less scope to fabulous invention. The note of the cuckoo is known to all the world; the history and nature of the bird itself still remains in great obscurity. That it devours its parent, that it changes its nature with the season, and becomes a sparrow-hawk, were fables invented of this bird, and are now sufficiently refuted. But where it resides in winter, or how it provides for its supply during that season, still continues undiscovered.

This singular bird, which is somewhat less than a pigeon, shaped like a magpie, and of a greyish colour, is distinguished from all other birds by its round prominent nostrils. Having disappeared all the winter, it discovers itself in our country early in the spring, by its well known call. Its note is heard earlier or later as the season seems to be more or less forward, and the weather more or less inviting. From the cheerful voice of this bird the farmer may be instructed in the real advancement of the year. The fallibility of human calendars is but too well known; but from this bird's note, the husbandman may be taught when to sow his most useful seeds, and do such work as depends upon a certain temperature of the air. These feathered guides come to us heaven-taught, and point out the true commencement of the season.

The cuckoo, that was silent some time after its appearance, begins at first feebly, and at very distant intervals, to give its call, which as the summer advances, improves both in its frequency and loudness. This is an invitation to courtship, and used only by the male, who sits generally perched upon some dead tree, or bare bough, and repeats his song, which he loses as soon as the genial season is over. His note is pleasant, though uniform; and from an association of ideas, seldom occurs to the memory without reminding us of the sweets of summer. Custom too has fixed a more ludicrous association to this note, which, however, we that are bachelors need be in no pain about. This reproach seems to arise from this bird's making use of the bed or nest of another to deposit its own brood in.

However this may be, nothing is more certain than that the female makes no nest of her own. She repairs for that purpose to the nest of some other bird, generally the water-wagtail, or the hedge sparrow and having devoured the eggs of the owner, lays her own in their place. She usually lays but one, which is speckled, and of the size of a blackbird's. This the fond foolish bird hatches with great assiduity, and when excluded, finds no difference in the great ill-looking changeling from her own. To supply this voracious creature, the credulous nurse toils with unusual labour, no way sensible that she is feeding up an enemy to her race, and one of the most destructive robbers of her future progeny.

It was once doubted whether these birds were carnivorous, but Reaumur was at the pains of breeding up several, and found that they would not feed upon bread and corn, but flesh and insects were their favourite nourishment. He found it a very difficult task to teach them to peck, for he was obliged to feed them for a full month after they were grown as big as the mother. Insects, however, seemed to be their peculiar food when young, for they devoured flesh by a kind of constraint, as it was always put into their mouths; but meal-worm insects they flew to, and swallowed of their own accord most greedily. Indeed their gluttony is not to be wondered at, when we consider the capacity of their stomach, which is enormous, and reaches from the breast-bone to the vent. It is partly membranous, partly muscular, and of a prodigious capacity; yet still they are not to be supposed as birds of prey, for they have neither the strength nor the courage. On the contrary, they are naturally weak and fearful, as appears by their flying from small birds, which every where pursue them. The young birds are brown, mixed with black, and in that state they have been described by some authors as old ones.

The cuckoo, when fledged and fitted for flight, follows its supposed parent but for a little time; its appetites for insect food increasing, as it finds no great chance for a supply in imitating its little conductor, it parts good friends, the step-child seldom offering any violence to its nurse. Nevertheless, all the little birds of the grove seem to consider the young cuckoo as an enemy, and revenge the cause of their kind by their repeated insults. They pursue it wherever it flies, and oblige it to take shelter in the thickest branches of some neighbouring tree. All the smaller birds form the train of its pursuers; but the wry-neck in particular is found the most active in the chace; and from thence it has been called by many the cuckoo's attendant and provider. But it is very far from following with a friendly intention; it only pursues as an insulter, or a spy, to warn all its little companions of the cuckoo's depredations.

Such are the manners of this bird while it continues to reside, or to be seen amongst us. But early, at the approach of winter, it totally disappears, and its passage can be traced to no other country. Some suppose that it lies hid in hollow trees, and others that it passes into warmer climates. Which of these opinions is true is very uncertain, as there are no facts related on either side that can be totally relied on. To support the opinion that they remain torpid during the winter at home, Willoughby introduces the following story, which he delivers upon the credit of another. "The servant of a gentleman, in the country, having stocked up, in one of their meadows, some old, dry, rotten willows, thought proper, on a certain occasion, to carry them home. In heating a stove, two logs of this timber were put into the furnace beneath, and fire applied as usual. But soon, to the great surprise of the family, was heard the voice of a cuckoo, singing three times from under the stove. Wondering at so extraordinary a cry in winter time, the servants ran and drew the willow logs from the furnace, and in the midst of one of them saw something move: wherefore, taking an axe, they opened the hole, and thrusting in their hands, first they plucked out nothing but feathers; afterwards they got hold of a living animal, and this was the cuckoo that had waked so very opportunely for its own safety. "It was, indeed," continues our historian, "brisk and lively, but wholly naked and bare of feathers, and without any winter provison in its hole. This cuckoo the boys kept two years afterwards alive in the stove; but whether it repaid them with a second song, the author of the tale has not thought fit to inform us."

The most probable opinion on this subject is, that as quails and woodcocks shift their habitations in winter, so also does the cuckoo; but to what country it retires, or whether it has ever been seen on its journey, are questions that I am wholly incapable of resolving.

Of this bird there are many kinds in various parts of the world, not only differing in their colours, but their size. Brisson makes not less than twenty-eight sorts of them; but what analogy they bear to the English cuckoo, I will not take upon me to determine. He talks of one, particularly of Brazil, as making a most horrible noise in the forests, which, as it should seem, must be a very different note from that by which our bird is distinguished at home.

CHAPTER V

OF THE PARROT AND ITS AFFINITIES.

THE Parrot is the best known among us of all foreign birds, as it unites the greatest beauty with the greatest docility. Its voice also is more like a man's than that of any other; the raven is too hoarse, and the jay and magpie too shrill to resemble the truth; the parrot's note is of the true pitch, and capable of a number of modulations that even some of our orators might wish in vain to imitate.

The ease with which this bird is taught to speak, and the great number of words which it is capable of repeating, are no less surprising. We are assured, by a grave writer, that one of these was told to repeat a whole sonnet from Petrarch; and that I may not be wanting in my instance, I have seen a parrot, belonging to a distiller, who had suffered pretty largely in his circumstances from an informer who lived opposite him, very ridiculously employed. This bird was taught to pronounce the ninth commandment, *Thou shalt not bear false witness against thy neighbour*, with a very clear, loud, articulate voice. The bird was generally placed in its cage over against the informer's house, and delighted the whole neighbourhood with its persevering exhortations.

Willoughby tells a story of a parrot, which is not so dull as those usually brought up when the bird's facility of talking happens to be the subject. "A parrot belonging to King Henry the Seventh, who then resided at Westminster, in his palace by the river Thames, had learned to talk many words from the passengers as they happened to take water. One day, sporting on its perch, the poor bird fell into the water, at the same time crying out, as loud as he could, *A boat! twenty pounds for a boat!* A waterman, who happened to be near, hearing the cry, made to the place where the parrot was floating, and taking him up restored him to the king. As it seems the bird was a favourite, the man insisted that he ought to have a reward rather equal to his services than his trouble; and, as the parrot had cried twenty pounds, he said the king was bound in honour to grant it. The king at last agreed to leave it to the parrot's own determination, which the bird hearing, cried out, *give the knave a groat*."

The parrot, which is so common as a foreign bird with us, is equally so as an indigenous bird in the climates where it is produced. The forests swarm with them; and the rook is not better known with us than the parrot in almost every part of the East and West Indies It is in vain that our naturalists have attempted to arrange the various species of this bird; new varieties daily offer to puzzle the system-maker, or to demonstrate the narrowness of his catalogues. Linnæus makes the number of its varieties amount to forty-seven; while Brisson doubles the number, and extends his catalogue to ninety-five. Perhaps even this list might be increased, were every accidental change of colour to be considered as constituting a new species. But, in fact, natural history gains little by these discoveries; and as its dominions are extended it becomes more barren. It is asserted, by sensible travellers, that the natives of Brazil can change the colour of a parrot's plumage by art. If this be true, and I am apt to believe the information, they can make new species at pleasure, and thus cut out endless work for our nomenclators at home.

Those who usually bring these birds over, are content to make three or four distinctions, to which they give names; and with these distinctions I will content myself also. The large kind, which are called *maccaws:* the next size are simply called *parrots:* those which are entirely white, are called *lories:* and the lesser size of all are called *parakeets.* The difference between even these is rather in size than any other peculiar conformation, as they are all formed alike, having toes, two before and two behind, for climbing and holding; strong hooked bills for breaking open nuts, and other hard substances, on which they feed; and loud harsh voices, by which they fill their native woods with clamour.

But there are further peculiarities in their contormation: and first, their toes are contrived in a singular manner, which appears when they walk or climb, and when they are eating. For the first purpose they stretch two of their toes forward, and two backward; but when they take their meat, and bring it to their mouths with their foot, they dexterously and nimbly turn the greater hind toe forward, so as to take a firmer grasp of the nut, or the fruit they are going to feed on, standing all the while upon the other leg. Nor even do they present their food in the usual manner; for other animals turn their meat inwards to the mouth; but these, in a seemingly awkward position, turn their meat outwards, and thus hold the hardest nuts, as if in one hand, till with their bills they break the shell, and extract the kernel.

The bill is fashioned with still greater peculiarities; for the upper chap, as well as the lower, are both moveable. In most other birds the upper chap is connected, and makes but one piece with the skull; but in these, and in one or two species of the feathered tribe more, the upper chap is connected to the bone of the head by a strong membrane, placed on each side, that lifts and depresses it at pleasure. By this contrivance they can open their bills the wider; which is not a little useful, as the upper chap is so hooked and so over-hanging, that, if the lower chap only had motion, they could scarce gape sufficiently to take any thing in for their nourishment.

Such are the uses of the beak and the toes, when used separately, out they are often employed both together when the bird is exercised in climbing. As these birds cannot readily hop from bough to bough, their legs not being adapted for that purpose, they use both the beak and the feet; first catching hold with the beak, as if with a hook, and drawing up the legs and fastening them, then advancing the head and beak again, and so putting forward the body and the feet alternately, till they attain the height they aspire to.

The tongue of this bird somewhat resembles that of a man; for which reason, some pretend that it is well qualified to imitate the human speech; but the organs by which these sounds are articulated lie farther down in the throat, being performed by the great motion which the *os hyoides* has in these birds above others.

The parrot, though common enough in Europe, will not, however, breed here. The climate is too cold for its warm constitution, and though it bears our winter when arrived at maturity, yet it always seems sensible of its rigour, and loses both its spirit and appetite during the colder parts of the season. It then becomes torpid and inactive, and seems quite changed from that bustling loquacious animal which it appeared in its native forest, where it is almost ever upon the wing. Notwithstanding, the parrot lives even with us a considerable time, if it be properly attended to; and indeed it must be owned that it employs but too great a part of some people's attention.

The extreme sagacity and docility of the bird may plead as the best excuse for those who spend whole hours in teaching their parrots to speak, and indeed the bird on those occasions seems the wisest animal of the two. It at first obstinately resists all instruction, but seems to be won by perseverance, makes a few attempts to imitate the first sounds, and when it has got one word distinct, all the succeeding come with greater facility. The bird generally learns most in those families where the master or mistress have the least to do; and becomes more expert, in proportion as its instructors are idly assiduous. In going through the towns of France some time since, I could not help observing how much plainer their parrots spoke than ours, and how very distinctly I understood their parrots speak French, when I could not understand our own, though they spoke my native language. I was at first for ascribing it to the different qualities of the two languages, and was for entering into an elaborate discussion on the vowels and consonants; but a friend that was with me solved the difficulty at once, by assuring me that the French women scarce did any thing else the whole day than sit and instruct their feathered pupils; and that the birds were thus distinct in their lessons in consequence of continual schooling.

The parrots of France are certainly very expert, but nothing to those of the Brazils, where the education of a parrot is considered as a very serious affair. The history of Prince Maurice's parrot, given us by Mr. Locke, is too well known to be repeated here; but Clusius assures us that the parrots of that country are the most sensible and cunning of all animals not endued with reason. The great parrot, called the *aicurous*, the head of which is adorned with yellow, red, and violet, the body green, the end of the wings red, the feathers of the tail long and yellow; this bird, he asserts, which is seldom brought into Europe, is a prodigy of understanding. " A certain Brazilian woman that lived in a village two miles distant from the island on which we resided, had a parrot of this kind which was the wonder of the place. It seemed endued with such understanding as to discern and comprehend whatever she said to it. As we sometimes used to pass by that woman's house, she used to call upon us to stop, promising, if we gave her a comb, or a looking-glass, that she would make her parrot sing and dance to entertain us. If we agreed to her request, as soon as she had pronounced some words to the bird, it began not only to leap and skip on the perch on which it stood, but also to talk and to whistle, and imitate the shoutings and exclamations of the Brazilians when they prepare for battle. In brief, when it came into the woman's head to bid it sing, it sang; to dance, it danced But if, contrary to our promise, we refused to give the woman the little present agreed on, the parrot seemed to sympathize in her resentment, and was silent and immoveable; neither could we, by any means, provoke it to move either foot or tongue."

This sagacity, which parrots show in a domestic state, seems also natural to them in their native residence among the woods. They live together in flocks, and mutually assist each other against other animals, either by their courage or their notes of warning. They generally breed in hollow trees, where they make a round hole, and do not line their nests within. If they find any part of a tree beginning to rot from the breaking off of a branch, or any such accident, this they take care to scoop, and to make the hole sufficiently wide and convenient; but it sometimes happens that they are content with the hole which a woodpecker has wrought out with greater ease before them; and in this they prepare to hatch and bring up their young.

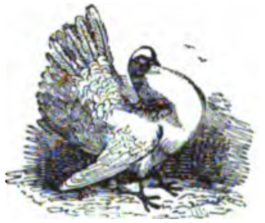
They lay two or three eggs; and probably the smaller kind may lay more; for it is a rule that universally holds through Nature, that the smallest animals are always the most prolific; for being from their natural weakness, more subject to devastation, Nature finds it necessary to replenish the species by superior fecundity. In general, however, the number of their eggs is stinted to two, like those of the pigeon, and they are about the same size. They are always marked with little specks, like those of a partridge, and some travellers assure us that they are always found in the trunks of the tallest, straightest, and the largest trees. The natives of these countries, who have little else to do, are very assiduous in spying out the places where the parrot is seen to nestle, and generally come with great joy to inform the Europeans, if there be any, of the discovery. As those birds have always the greatest docility that are taken young, such a nest is often considered as worthy taking some trouble to be possessed of; and for this purpose the usual method of coming at the young, is, by cutting down the tree. In the fall of the tree it often happens that the young parrots are killed; but if one of them survives the shock, it is considered as a sufficient recompense.

Such is the avidity with which these birds are sought when young; for it is known they always speak best when their ear has not been anticipated by the harsh notes of the wild one. But as the natives are not able upon all occasions to supply the demand for young ones, they are contented to take the old; and for that purpose shoot them in the woods with heavy arrows, headed with cotton, which knock down the bird without killing it. The parrots thus stunned are carried home: some die, but others recover, and, by kind usage, and plentiful food, become talkative and noisy.

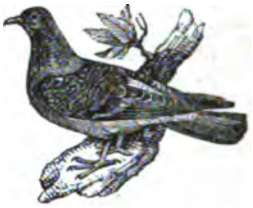
But it is not for the sake of their conversation alone that the parrot is sought after among the savages; for though some of them are but tough and ill-tasted, yet there are other sorts, particularly of the small parakeet tribe, that are very delicate food. In general it obtains that whatever fruit or grain these birds mostly feed upon, their flesh partakes of the flavour, and becomes good or ill-tasted, according to the quality of that particular diet. When the guava is ripe, they are at that season fat and tender; if they feed upon the seed of the acajou, their flesh contracts an agreeable flavour of garlic; if they feed upon seed of the spicy trees, their flesh then tastes of cloves and cinnamon; while, on the contrary, it is insupportably bitter if the berries they feed on are of that quality. The seed of the cotton-tree intoxicates them in the same manner that wine does man; and even wine itself is drank by parrots, as Aristotle assures us, by which they are thus rendered more talkative and amusing. But of all food, they are fondest of the carthamus, or bastard saffron; which though strongly purgative to man, perfectly agrees with their constitution, and fattens them in a very short time.

Of the paroqueet kind in Brazil, Labat assures us, that they are the most beautiful in their plumage, and the most talkative birds in nature. They are very tame, and appear fond of mankind; they seem pleased with holding parley with him; they never have done; but while he continues to talk, answer him, and appear resolved to have the last word; but they are possessed of another quality which is sufficient to put an end to this association: their flesh is the most delicate imaginable, and highly esteemed by those who are fonder of indulging their appetites than their ears. The fowler walks into the woods, where they keep in abundance; but as they are green, and exactly the colour of the leaves among which they sit, he only hears their prattle, without being able to see a single bird; he looks round him, sensible that his game is within gun-shot in abundance, but is mortified to the last degree that it is impossible to see them. Unfortunately for these little animals, they are restless and ever on the wing, so that in flying from one tree to another, he has but too frequent opportunities of destroying them; for as soon as they have stripped the tree on which they sat of all its berries, some one of them flies off to another; and, if that be found fit for the purpose, it gives a loud call, which all the rest resort to. That is the opportunity the fowler has long been waiting for; he fires in among the flock, while they are yet on the wing, and he seldom fails of bringing down a part of them. But it is singular enough to see them when they see their companions fallen. They set up a loud outcry, as if they were chiding their destroyer, and do not cease till they see him preparing for a second charge.

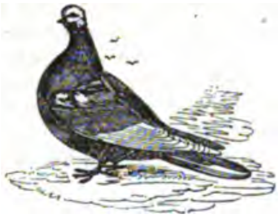
But though there are so many motives for destroying these beautiful birds, they are in very great plenty; and in some countries on the coast of Guinea, they are considered by the Negroes as their greatest tormentors. The flocks of parrots persecute them with their unceasing screaming, and devour whatever fruits they attempt to produce by art in their little gardens. In other places they are not so destructive, but sufficiently common; and, indeed, there is scarce a country of the tropical climates that has not many of the common kind, as well as some peculiarly its own. Travellers have counted more than a hundred different kinds on the continent of Africa only; there is one country in particular, north of the Cape of Good Hope, which takes its name from the multitude of parrots which are seen in its woods. There are white parrots seen in the burning regions of Ethiopia; in the East Indies they are of the largest size; in South America they are



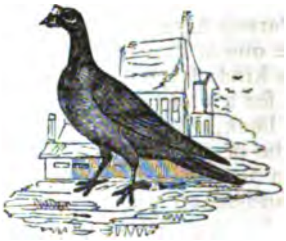
Fantail Pigeon, p. 131.



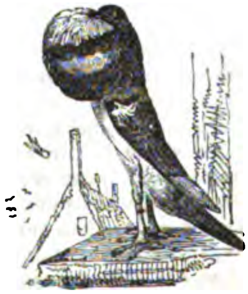
Wild Pigeon, p. 131.



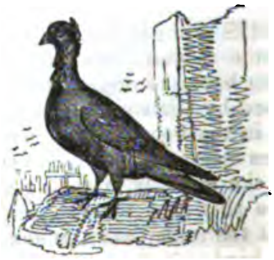
Tumbler, p 131.



Carrier, p. 131.



Pouter, p. 131.



Helmet Pigeon, p. 131

To face p. 131, vol. iii.

docile and talkative; in all the islands of the Pacific Sea and the Indian Ocean, they swarm in great variety and abundance, and add to the splendour of those woods which Nature has dressed in eternal green.

So generally are these birds known at present, and so great is their variety, that nothing seems more extraordinary than that there was but one sort of them known among the ancients, and that at a time when they pretended to be masters of the world. If nothing else could serve to show the vanity of a Roman's boast, the parrot-tribe might be an instance, of which there are a hundred kinds now known, not one of which naturally breeds in the countries that acknowledged the Roman power. The green parakeet, with red neck, was the first of this kind that was brought into Europe, and the only one that was known to the ancients, from the time of Alexander the Great to the age of Nero: This was brought from India, and when afterwards the Romans began to seek and rummage through all their dominions for new and unheard-of luxuries, they at last found out others in Gaganda, an island of Ethiopia, which they considered as an extraordinary discovery.

Parrots have usually the same disorders with other birds, and they have one or two peculiar to their kind. They are sometime struck by a kind of apoplectic blow, by which they fall from their perches, and for a while seem ready to expire. The other is the growing of the beak, which becomes so very much hooked as to deprive them of the power of eating. These infirmities, however, do not hinder them from being long-lived; for a parrot, well kept, will live five or six-and-twenty years.

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CHAPTER VIII.

THE PIGEON AND ITS VARIETIES.

THIS is one of the birds which, from its great fecundity, we have, in some measure, reclaimed from a state of Nature, and taught to live in habits of dependence. Indeed, its fecundity seems to be increased by human cultivation, since those pigeons that live in a wild state in the woods are by no means so fruitful as those in our pigeon-houses nearer home. The power of increase in most birds depends upon the quantity of their food, and it is seen in more than one instance that man by supplying food in plenty, and allowing the animal at the same time a proper share of freedom, has brought some of those kinds which are known to lay but once a year, to become much more prolific.

The tame pigeon, and all its beautiful varieties, derive their origin from one species, the Stock-Dove only, the English name implying its being the stock or stem from whence the other domestic kinds have been propagated. This bird, in its natural state, is of a deep bluish ash colour; the breast dashed with a fine changeable green and purple; its wings marked with two black bars; the back white and the tail barred near the end with black. These are the colours of the pigeon in a state of Nature; and from these simple tints has man by art propagated a variety that words cannot describe, nor even fancy suggest. However, Nature still perseveres in her great outline; and though the form, colour, and even the fecundity of these birds may be altered by art, yet their natural manners and inclinations continue still the same.

The stock-dove, in its native woods, differs from the ring-dove, a bird that has never been reclaimed, by its breeding in the holes of rocks and the hollows of trees. All other birds of the pigeon kind build, like rooks, in the topmost branches of the forest, and choose their habitation as remote as possible from man. But this species soon takes to build in artificial cavities, and from the temptation of a ready provision and numerous society, easily submits to the tyranny of man. Still, however, it preserves its native colour for several generations, and becomes more variegated only in proportion as it removes from the original simplicity of its colouring in the woods.

The Dove-house Pigeon, as is well known, breeds every month: but then it is necessary to supply it with food when the weather is severe, or the fields are covered with snow. Upon other occasions it may be left to provide for itself, and it generally repays the owner for its protection. The pigeon lays two white eggs, which most usually produce young ones of different sexes. For the laying of each egg, it is necessary to have a particular congress with the male; and the egg is usually deposited in the afternoon. When the eggs are thus laid, the female, in the space of fifteen days not including the three days during which she is employed in laying, continues to hatch, relieved at intervals by the male. The turns are usually regulated with great exactness. From three or four o'clock in the evening till nine the next day, the female continues to sit; she is then relieved by the male, who takes his place from ten till three, while his mate is feeding abroad. In this manner they sit alternately till the young are excluded. If, during this term, the female delays to return at the expected time, the male follows, and drives her to the nest; and should he in his turn be dilatory, she retaliates with equal severity.

The young ones, when hatched, require no food for the three first days, only wanting to be kept warm, which is an employment the female takes entirely upon herself. During this period she never stirs out, except for a few minutes to take a little food. From this they are fed for eight or ten days with corn or grain of different kinds, which the old ones gather in the fields, and keep treasured up in their crops, from whence they throw it up again into the mouths of their yonng ones, who very greedily demand it.

As this method of feeding the young from the crop is different in birds of the pigeon kind from all others, it demands a more detailed explanation. Of all birds, for its size, the pigeon has the largest crop, which is also made in a manner quite peculiar to the kind. In two of these that were dissected by a member of the Royal Academy of Sciences, it was found that if the anatomist blew air into the wind-pipe, it distended the crop or gullet to a prodigious size. This was the more extraordinary, as there seemed to be no communication whatever between these two receptacles, as the conduit by which we breathe, as every one knows, leads to a very different receptacle from that where we put our food. By what apertures the air blown into the lungs of the pigeon makes its way into the crop, is unknown; but nothing is more certain than that these birds have a power of filling the crop with air; and some of them, which are called *croppers*, distend it in such a manner that the bird's breast seems bigger than its body. The peculiar mechanism of this part is not well known; but the necessity for it in these animals is pretty obvious. The pigeon, as we all know, lives entirely upon grain and water: these are mixed together in the crop; and in the ordinary way are digested in proportion as the bird lays in its provision. But to feed its young, which are very voracious, it is necessary to lay in a store greater than ordinary, and to give the food a kind of half maceration to suit their tender appetites. The heat of the bird's body, assisted by air and numerous glands separating a milky fluid, are the most necessary instruments for this operation: but, in proportion as the food macerates, it begins to swell also, and the crop must of consequence be considerably dilated. Still, however, the air which is contained in it gives the bird a power of contracting it at pleasure; for if it were filled with more solid substances, the bird could have no power to compress it. But this is not the case; the bird can compress its crop at pleasure, and driving out the air, can thus drive out the food also, which is forced up the gullet, like a pellet from a pop-gun. The young ones open-mouthed, receive this tribute of affection, and are thus fed three times a day. In feeding, the male usually supplies the young female, while the old female supplies the young of the opposite sex. The food with which they are supplied, is more macerated in the beginning; but as they grow older, the parents give it less preparation, and at last drive them out to shift for themselves. When well fed, however, the old ones do not wait for the total dismission of their young, but in the same nest are to be found young ones almost fit for flight, and eggs hatching at the same time.

The fidelity of the turtle-dove is proverbial, and makes the usual comparison of such poets as are content to repeat what others have said before them; but the pigeon of the dove-house is not so faithful, and having been subjected to man, it puts on licentiousness among its other domestic habits. Two males are often seen quarrelling for the same mistress; and when the female admits the addresses of a new gallant, her old companion seems to bear the contempt with some marks of displeasure, abstaining from her company, or if he approaches, it is only to chastise her. There have been instances when two males, being displeased with their respective mates, have thought proper to make an exchange, and have lived in great harmony with their new companions.

So great is the produce of this bird in its domestic state, that near fifteen thousand may, in the space of four years, be produced from a single pair. But the stock-dove seldom breeds above twice a year; for when the winter months come, the whole employment of the fond couple is rather for self-preservation, than transmitting a posterity

They seem, however, to have a stronger attachment to their young than those who are found to breed so often; whether it be that instinct acts more powerfully upon them in their state of nature, or that their affections are less divided by the multiplicity of claims, is doubtful.

It is from a species of these, therefore, that those pigeons which are called Carriers, and are used to convey letters, are produced. These are easily distinguished from all others by their eyes, which are compassed about with a broad circle of naked white skin, and by being of a dark blue or blackish colour. It is from their attachment to their native place, and particularly where they have brought up their young, that these birds are employed in several countries as the most expeditious carriers. They are first brought from the place where they were bred, and whither it is intended to send them back with information. The letter is tied under the bird's wing, and it is then let loose to return. The little animal no sooner finds itself at liberty, than its passion for its native spot directs all its motions. It is seen, upon these occasions, flying directly into the clouds to an amazing height, and then with the greatest certainty and exactness, directing itself, by some surprising instinct, towards home, which lies sometimes at many miles distance, bringing its message to those to whom it is directed. By what marks they discover the place, by what chart they are guided in the right way, is to us utterly unknown; certain it is, that in the space of an hour and a half they perform a journey of forty miles, which is a degree of despatch three times greater than the fleetest quadruped can perform. These birds are not brought up at present with so much care as formerly, when they were sent from governors in a besieged city to generals that were coming to relieve it without; when they were sent from princes to their subjects with the tidings of some fortunate event, or from lovers to their mistresses with expressions of their passion. The only use we now see made of them, is to be let fly at Tyburn, when the cart is drawn away; pretty much as when some ancient hero was to be interred, an eagle was let off from the funeral pile to complete his apotheosis.

The varieties of the tame pigeon are so numerous, that it would be a vain attempt to mention them; so much is the figure and colour of this bird under human control, that pigeon-fanciers, by coupling a male and female of different sorts, can breed them, as they express it, to a feather. From hence we have the various names of *croppers*, *carriers*, *jacobines*, *powters*, *runts*, and *turbits;* all birds that at first might have accidentally varied from the stock-dove; and then, by having these varieties still heightened by food, climate, and pairing, different species have been produced. But there are many species of the wild pigeon, which, though bearing a strong affinity to the stock-dove are, nevertheless, sufficiently different from it to deserve a distinct description.—The *ring-dove* is of this number; a good deal larger than the former, and building its nest with a few dry sticks, in the boughs of trees This seems a bird much fonder of its native freedom than the former, and attempts have been frequently made to render it domestic; but they have hitherto proved fruitless; for though their eggs have been hatched by the tame pigeon in a dove-house, yet as soon as they could fly, they always betook themselves to the woods where they were first produced. In the beginning of winter these assemble in great flocks in the woods, and leave off cooing; nor do they resume this note of courtship till the beginning of March, when the genial season, by supplying them with food, renews their desires.

The turtle-dove is a smaller, but a much shyer bird than any of the former. It may easily be distinguished from the rest by the iris of the eye, which is of a fine yellow, and by a beautiful crimson circle that encompasses the eye-lids. The fidelity of these birds is noted; and a pair being put in a cage, if one dies, the other will not survive it. The turtle-dove is a bird of passage, and few or none remain in our northern climates in winter. They fly in flocks when they come to breed here in summer, and delight in open, mountainous, sandy countries. But they build their nests in the midst of woods, and choose the most retired situations for incubation. They feed upon all sorts of grain, but are fondest of millet-seed.

To this short list might be added a long catalogue of foreign pigeons, of which we know little more than the plumage and the names. Indeed, the variety of their plumage is as beautiful as the names by which they are known are harsh and dissonant. The *ocotzimtzcan*, for instance, is one of the most splendid tenants of the Mexican forests; but few I believe would desire to learn the name only to be informed that it is covered with purple, green, and yellow plumage. To describe such birds, the historian's pen is not half such a useful implement as the painter's pencil

BOOK V.

OF BIRDS OF THE SPARROW KIND.

CHAPTER I.

OF BIRDS OF THE SPARROW KIND IN GENERAL.

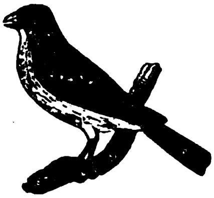
STILL descending from the larger to the smaller, we come to birds of the sparrow kind; or that class of beautiful little animals that, being less than a pigeon, go on diminishing till we arrive at the humming-bird, the smallest of the feathered creation.

The birds which compose this class, chiefly live in the neighbourhood of man, and are his greatest favourites. The falcon may be more esteemed, and the turkey more useful; but these he considers as servants, not as friends; as animals reclaimed merely to supply him with some of the conveniences of life: but these little painted songsters have his affections, as well from their beauty as their melody; it is this delightful class that fill his groves with harmony, and lift his heart to sympathize with their raptures. All the other classes are either mute or screaming; it is this diminutive tribe only that have voices equal to the beauty of their figures; equally adapted to rejoice man, and delight each other.

As they are the favourites of man, so they are chiefly seen near him. All the great birds dread his vicinity, and keep to the thickest darkness of the forest, or the brow of the most craggy precipice: but these seldom resort to the thicker parts of the wood; they keep near its edges, in the neighbourhood of cultivated fields, in the hedge-rows of farm-grounds, and even in the yard, mixing with the poultry.

It must be owned, indeed, that their living near man is not a society of affection on their part, as they approach inhabited grounds merely because their chief provision is to be found there. In the depth of the desert, or the gloom of the forest, there is no grain to be picked up; none of those tender buds that are so grateful to their appetites; insects themselves, that make so great a part of their food, are not found there in abundance; their natures being unsuited to the moisture of the place. As we enter, therefore, deeper into uncultivated woods, the silence becomes more profound; every thing carries the look of awful stillness; there are none of those warblings, none of those murmurs that awaken attention, as near the habitations of men: there is nothing of that confused buzz, formed by the united, though

Linnet, p. 142.



Bunting, p. 142.

Black Bird, p. 142.

Fly Catcher, p. 143.

Ring Dove, p. 131.

Crowned Pigeon, p. 131.

To face p. 136, vol. iii.

distant voices of quadrupeds and birds; but all is profoundly dead and solemn. Now and then, indeed, the traveller may be roused from this lethargy of life by the voice of a heron, or the scream of an eagle; but his sweet little friends and warblers have totally forsaken him.

There is still another reason for these little birds avoiding the depths of the forest, which is, that their most formidable enemies usually reside there. The greater birds, like robbers, choose the most dreary solitude for their retreat; and if they do not find, they make a desert all around them. The small birds fly from their tyranny, and take protection in the vicinity of man, where they know their more unmerciful foes will not venture to pursue them.

All birds, even those of passage, seem content with a certain district to provide food and centre in. The red-breast or the wren seldom leaves the field where it has been brought up, or where its young have been excluded; even though hunted, it flies along the hedge, and seems fond of the place with an imprudent perseverance. The fact is, all these small birds mark out a territory to themselves, which they will permit none of their own species to remain in; they guard their dominions with the most watchful resentment, and we seldom find two male tenants in the same hedge together.

Thus, though fitted by Nature for the most wandering life, these little animals do not make such distant excursions, during the season of their stay, as the stag or the leveret Food seems to be he only object that puts them in motion, and when that is provided for them in sufficient plenty, they never wander. But as that is seldom permanent through the year, almost every bird is then obliged to change its abode. Some are called *birds of passage*, because they are obliged to take long journeys for this purpose; but, strictly speaking, almost every other kind are birds of passage, though their migration may not be to places so remote. At some particular season of the year, all small birds migrate either from one country to another, or from the more inland provinces toward the shore.

There are several persons who get a livelihood by watching the seasons when our small birds begin to migrate from one country to another, and by taking them with nets in their passages. The birds are found to fly, as the bird-catchers term it, chiefly during the month of October, and part of September and November. There is also another flight in March, which is much less considerable than that in autumn. Nor is it less remarkable that several of these species of flight-birds make their appearance in regular succession. The pippet, for instance, begins its flight every year about Michaelmas, when they are caught in greatest numbers. To this the wood-lark succeeds and continues its flight till towards the middle of October; other birds follow, but are not so punctually periodical; the green-finch does not begin till the frost obliges it to seek for a change. These birds, during those months, fly from day-break till twelve at noon; and there is afterwards a small flight from two till night. Such are the seasons of the migration of the birds which have been usually considered as stationary, and on these occasions they are caught in great abundance, as they are on their journey. But the same arts used to allure them upon other occasions, would be utterly fruitless, as they avoid the nets with the most prudent circumspection. The autumnal flighprobably consists of the parents conducting their new-fledged young to those places where there is sufficient provision, and a proper temperament of the air during the winter season; and their return in spring is obviously from an attachment to the place which was found so convenient before for the purposes of nestling and incubation.

Autumn is the principal season when the bird-catcher employs his art to catch these wanderers. His nets are a most ingenious piece of mechanism, being generally twelve yards and a half long, and two yards and a half wide, and so contrived as from a flat position to rise on each side, and clap over the birds that are decoyed to come between them. The birds in their passage are always observed to fly against the wind; hence there is a great contention among the bird-catchers which shall gain the wind; for example, if it is westerly, the bird-catcher who lays his nets most to the east, is sure of the most plentiful sport if his call-birds are good. For this purpose he generally carries five or six linnets, two gold-finches, two green-finches, one wood-lark, one red-poll, and perhaps a bull-finch, a yellow-hammer, a tit-lark, and an aberdavine: these are placed at small distances from the nets in little cages. He has besides what he calls his *flur-birds*, which are placed upon a moveable perch, which the bird-catcher can raise at pleasure by means of a string; and these he always lifts gently up and down as the wild bird approaches. But this is not enough to allure the wild bird down; it must be called by one of the call-birds in the cages; and these, by being made to moult prematurely in a warm cage, call louder and better than those that are wild and at freedom. There even appears a malicious joy in these call-birds to bring the wild ones into the same state of captivity, while at the same time their call is louder, and their plumage brighter than in a state of nature. Nor is their sight or hearing less exquisite, far exceeding that of the bird-catcher; for the instant the wild birds are perceived, notice is given by one to the rest of the call-birds, who all unite in the same tumultuous ecstacy of pleasure. The call-birds do not sing upon those occasions as a bird does in a chamber, but incite the wild ones by short jerks, which, when the birds are good, may be heard at a great distance. The allurement of this call is so great, that the wild bird hearing it, is stopped in its most rapid flight; and, if not already acquainted with the nets, lights boldly within twenty yards perhaps of the bird-catcher, and on a spot which it would otherwise have quite disregarded. This is the opportunity wished for, and the bird-catcher pulling a string, the nets on each side rise in an instant, and clap directly down on the poor little unsuspecting visitant. Nay, it frequently happens that if half a flock only are caught, the remaining half will immediately afterwards light between the nets, and share the fate of their companions. Should only one bird escape, this unhappy survivor will also venture into danger till it is caught; such a fascinating power have the call-birds.

Indeed, it is not easy to account for the nature of this call whether it be a challenge to combat, an invitation to food, or a prelude to courtship. As the call-birds are all males, and as the wild birds that attend to their voice are most frequently males also, it does not seem that love can have any influence in their assiduity. Perhaps the wild females, in these flights, attend to and and obey the call below, and their male companions of the flight come down to bear them company. If this be the case, and that the females have unfaithfully led their mates into the nets, they are the first that are punished for their infidelity; the males are only made captives for singing, while the females are indiscriminately killed, and sold to be served up to the tables of the delicate.

Whatever be the motives that thus arrest a flock of birds in their flight, whether they be of gallantry or of war, it is certain that the small birds are equally remarkable for both. It is, perhaps, the genial desire that inspires the courage of most animals; and that being greatest in the males, gives them a greater degree of valour than the females. Small birds being extremely amorous, and remarkably brave. However contemptible these little warriors are to larger creatures, they are often but too formidable to each other; and sometimes fight till one of them yields up his life with the victory. But their contentions are sometimes of a gentler nature. Two male birds shall strive in song, till, after a long struggle, the loudest shall entirely silence the other. During these contentions, the female sits an attentive silent auditor, and often rewards the loudest songster with her company during the season.

Singing among birds is almost universally the prerogative of the male. With them it is the reverse of what occurs in the human kind. Among the feathered tribe, the heaviest cares of life fall to the lot of the female. Hers is the fatigue of incubation, and to her devolves the principal fatigue of nursing the helpless brood. To alleviate these fatigues, and to support her under them, Nature has given the song to the male. This serves as a note of blandishment at first to attract her affections; it serves as a note to delight her during the time of her incubation; but it serves still farther as a note of security, to assure her that no danger threatens to molest her. The male, while his mate is hatching, sits upon some neighbouring tree, continuing at once to watch and to sing. While his voice is heard, the female rests in confident security; and, as the poet expresses it, appears *most blessed when most unseen:* But if any appearance of danger offers to intrude, the male, that a moment before was so loud and sportive, stops all of a sudden, and this is a most certain signal to his mate to provide for her own security.

The nest of little birds seems to be of a more delicate contrivance than that of the larger kinds. As the volume of their bodies is smaller, the materials of which their nests are composed are generally warmer. It is easy to conceive that small things keep heat a shorter tim than those that are large. The eggs, therefore, of small birds re quire a place of more constant warmth than those of great ones, as being liable to cool more quickly; and accordingly their nests are built warmer and deeper, lined on the inside with softer substances, and guarded above with a better covering. But it sometimes happens that the little architects are disturbed in their operations, and then they are obliged to make a nest, not such as they wish, but such as they can. The bird whose nest has been robbed several times, builds up her last in a very slovenly manner, conscious that from the near approach of winter, she must not take time to give her habitation every possible advantage it is capable of receiving. When the nest is finished, nothing can exceed the cunning which the male and female employ to conceal it. If it is built in bushes, the pliant branches are so disposed as to hide it entirely from the view; if it be built among moss, nothing outwardly appears to show that there is a habitation within. It is always built near those places where food is found in greatest abundance; and they take care never to go in or out while there is any one in sight. The greater birds continue from their nest for some time, as their eggs take no damage in their absence; but the little birds are assiduous while they sit, and the nest is always occupied by the male when the female is obliged to seek for sustenance.

The first food of all birds of the sparrow kind is worms and insects. Even the sparrow and the gold-finch, that when adult, feed only upon grain, have both been fed upon insects while in the nest. The young ones, for some time after their exclusion from the shell, require no food; but the parent soon finds, by their chirping and gaping, that they begin to feel the approaches of hunger, and flies to provide them a plentiful supply. In her absence they continue to lie close together, and cherish each other by their mutual warmth. During this interval, also, they preserve a perfect silence, uttering not the slightest note, till the parent returns. Her arrival is always announced by a chirrup, which they perfectly understand, and which they answer altogether, each petitioning for its portion. The parent distributes a supply to each by turns, cautiously avoiding to gorge them, but to give them often, though little at a time. The wren will in this manner feed seventeen or eighteen young ones, without passing over one of them.

Such is the manner in which these birds bring forth and hatch their young; but it yet remains to usher them from the nest into life, and this they very assiduously perform. When they are full-fledged, and fitted for short flights, the old ones, if the weather be fair, lead them a few yards from the nest, and then compel them to return. For two or three succeeding days they are led out in the same manner, but each day to seek more distant adventures. When it is perceived that they can fly, and shift for themselves, then the parents forsake them for ever, and pay them no more attention than they do to other birds in the same flock. Indeed, it would seem among these little animals, that from the moment their young are set out, all future connection ceases between the male and female; they go separate ways, each to provide for itself during the rigours of winter, and at the approach of spring each seeks for a new associate.

In general, birds, when they come to pair in spring, associate with those of their own age and place of abode. Their strength or courage is generally in proportion to their age; the oldest females first feel the accesses of desire, and the oldest males are the boldest to drive off all younger pretenders. Those next in courage and desire, become pretenders, till they are almost all provided in turn. The youngest come last, as in fact they are the latest in their inclinations. But still there are several, both males and females, that remain unprovided for; either not happening to meet with each other, or at least not during the genial interval. Whether these mix with small birds of a different species, is a doubt which naturalists have not been able the-roughly to resolve. Addison, in some beautiful Latin lines, inserted in the Spectator, is entirely of opinion that birds observe a strict chastity of manners, and never admit caresses of a different tribe.

> Chaste are their instincts, faithful is their fire,
> No foreign beauty tempts to false desire;
> The snow-white vesture, and the glittering crown,
> The simple plumage, or the glossy down
> Prompt not their love. The patriot bird pursues
> His well-acquainted tints, and kindred hues;
> Hence thro' their tribes no mix'd, polluted flame,
> No monster-breed to mark the grove with shame:
> But the chaste black-bird, to its partner true,
> Thinks black alone is Beauty's fav'rite hue:
> The nightingale, with mutual passion blest,
> Sings to its mate, and nightly charms the nest:
> While the dark owl, to court his partner flies,
> And owns his offspring in their yellow eyes.

But whatever may be the poet's opinion, the probability is against this fidelity among the smaller tenants of the grove. The great birds are much more true to their species than these, and of consequence, the varieties among them are more few. Of the ostrich, the cassowary, and the eagle, there are but few species, and no arts that man can use, could probably induce them to mix with each other.

But it is otherwise with the small birds we are describing; it quires very little trouble to make a species between a gold-finch and a canary-bird, between a linnet and a lark. They breed frequently together, and produce a race, not like the mules among the quadrupeds, incapable of breeding again; for this motley mixture are as fruitful as their parents. What is so easily done by art, very probably often happens in a state of Nature; and when the male cannot find a mate of his own species, he flies to one of another, that, like him, has been left out in pairing. This, some historians think, may have given rise to the great variety of small birds that are seen among us; some uncommon mixture might first have formed a new species, and this might have been continued down, by birds of this species choosing to breed together.

Whether the great variety of our small birds may have arisen from this source, cannot now be ascertained; but certain it is, that they resemble each other very strongly, not only in their form and plumage, but also in their appetites and manner of living. The gold-finch, the linnet, and the yellow-hammer, though obviously of different species, yet lead a very similar life; being equally an active, lively, salacious tribe, that subsist by petty thefts upon the labours of mankind, and repay them with a song. Their nests bear a similitude, and they are about the same time in hatching their young, which is usually fifteen days. Were I therefore to describe the manners of these with the same minuteness that I have done the greater birds, I should only present the reader with a repetition of the same accounts; animated neither by novelty nor information. Instead, therefore, of specifying each sort, I will throw them into groups, uniting those together that practise the same manners, or that are remarkable for similar qualifications.

Willoughby has divided all the smaller birds into those that have slender bills, and those that have short and thick bills. Those with slender bills, chiefly live upon insects; those with short, strong bills, live mostly upon fruits and grain. Among slender-billed birds, he enumerates the thrush, the blackbird, the fieldfare, the starling, the lark, the titmouse, and the water-wagtail, the nightingale, the redstart, the robin-red-breast, the beccafigo, the stone chatter, the whinchat, the goldfinch, the white-throat, the hedge-sparrow, the pettichaps, the golden-crowned wren, the wren, the humming-bird, and several other small birds of the sparrow kind, unknown in this part of the world.

All these, as was said, live for the most part upon insects; and are consequently of particular benefit to man. By these are his grounds cleared of the pernicious swarms of vermin that devour the budding leaves and flowers; and that even attack the root itself, before even the vegetable can come to maturity. These seek for, and destroy the eggs of insects that would otherwise propagate in numbers beyond the arts of man to extirpate: they know better than man where to seek for them; and thus at once satisfy their own appetites, and render him the most essential services.

But this is not the only merit of this tribe: in it we have the sweetest songsters of the grove; their notes are softer, and their manner more musically soothing than those of hard-billed birds. The foremost in musical fame, are, the nightingale, the thrush, the blackbird, the lark, the red-breast, the black-cap, and the wren.

Birds of the sparrow kind, with thick and short bills, are the grosbeak, the greenfinch, the bullfinch, the crossbill, the house-sparrow, the chaffinch, the brambling, the goldfinch, the linnet, the siskin, the bunting, the yellow-hammer, the ortolan, the wheat-ear, and several other foreign birds, of which we know rather the names than the history. These chiefly feed upon fruits, grain, and corn.—They are often troublesome to man, as they are a numerous tribe: the harvest often suffers from their depredations; and while they are driven off from one end of the field, they fly round, and come in at the other. But these also have their uses: they are frequently the distributors of seeds into different districts: those grains which they swallow, are sometimes not wholly digested; and these, laid upon a soil congenial to them, embellish the face of Nature with that agreeable variety, which art but vainly attempts to imitate. The mistletoe plant, which we often see growing on the tops of elm and other trees, has been thought to be propagated in this manner; yet, as it is often seen growing on the under side of the branch, and sometimes on a perpendicular shoot, it seems extraordinary how a seed could be deposited in that situation. However this, be, there are many plants propagated from the depositions of birds; and some seeds are thought to thrive the better for first having undergone a kind of maceration in the stomach of the little animal, before it is voided on the ground.

There are some agreeable songsters in this tribe also; and those who like a loud piercing pipe, endued with great variety and perseverance, will be pleased most with their singing. The songsters of this class are the Canary-bird, the linnet, the chaffinch, the goldfinch, the greenfinch, the bullfinch, the brambling, the sisken, and the yellow-hammer. The note of these is not so generally pleasing as that of the soft-billed birds, but it usually holds longer; and, in a cage, these birds are more easily fed, and hardy.

This class of small birds, like all the greater, has its wanderers, that leave us for a season, and then return, to propagate, to sing, or to embellish the landscape here. Some of this smaller kind, indeed, are called *birds of passage*, that do not properly come under the denomination; for though they disappear in one place, they never leave the kingdom, but are seen somewhere else. But there are many among them that take longer flights, and go to a region colder or warmer, as it suits their constitutions. The fieldfare, and the red-wing breed, pass their summers in Norway, and other cold countries, and are tempted hither to our mild winters, and to those various berries which then abound with us, and make their principal food. The hawfinch and the crossbill are uncertain visitants, and have no stated times of migration. Swallows of every species disappear on the approach of winter. The mightingale the blackcap, the fly-catcher, the willow wren, the wheatear, the whin-chat, and the stone-chatter, leave us long before the approach of winter; while the siskin and the linnet only forsake us when our winters are more than usually severe. All the rest of the smaller tribe never quit this country; but support the severest rigours of the climate.

Yet it must not be supposed that the manners of our little birds prevail in all other countries; and that such kinds as are stationary with us, never wander in other parts of Europe: on the contrary, it happens that many of those kinds which are birds of passage in England, are seen, in other places, never to depart, but to make one country their fixed residence, the whole year round. It is also frequent, that some birds, which with us are faithful residents, in other kingdoms put on the nature of birds of passage, and disappear for a season.

The swallow, which with us is particularly remarked for being a bird of passage, in Upper Egypt and in the island of Java, breeds and continues the whole year, without ever disappearing. Larks, that remain with us the year throughout, are birds of passage in Sweden; and forsake that climate in winter to return again with the returning spring. The chaffinch, that with us is stationary, appears during the winter in Carolina and Virginia; but disappears totally in summer, to breed in the more northern regions. In Sweden, also, these little birds are seen returning, at the approach of spring, from the warmer climates, to propagate; which, being accomplished by the latter end of autumn, the males and females separate; the males to continue among their native snows, the females to seek a warmer and gentler winter. On this occasion, they are seen in flocks, that darken all the air, without a single male among them, making their way into the more southern regions of Denmark, Germany, and Holland. In this Amazon-like retreat, thousands fall by the way; some by fatigue, some by want; but the greatest number by the nets of the fowler; the taking them being one of the chief amusements among the gentry where they pass. In short, the change of country with all this little tribe, is rather a pilgrimage than a journey; a migration rather of necessity than of choice.

Having thus given a general idea of the birds of this class, it was proper to give some account of the most remarkable among them

CHAPTER II.

OF THE THRUSH AND ITS AFFINITIES.

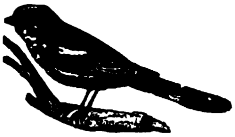
With the Thrush we may rank the red-wing, the fieldfare, the blackbird, the ring-ouzel, and the water-ouzel.

These are the largest of the sparrow kind, and may be distinguished from all others of this class, as well by their size, which is well known, as by their bills, which are a little bending at the point; a small notch near the end of the upper chap, and the outmost toe adhering as far as the first joint of the middle toe. To this tribe may also be added the stare or starling, which, though with a flat bill, too much resembles these birds to be placed any where else.

The Missel-Thrush is distinguished from all of the kind by its superior size, being much larger than any one of them. It differs scarcely in any other respect from the throstle, except that the spots on the breast are larger. It builds its nest in bushes, or on the side of some tree, as all of this kind are found to do, and lays four or five eggs in a season. Its song is very fine, which it begins in spring, sitting on the summit of a high tree. It is the largest bird of all the feathered tribe that has music in its voice; the note of all greater birds being either screaming, chattering, or croaking. It feeds on insects, holly, and mistletoe-berries; and sometimes sends forth a very disagreeable scream when frightened or disturbed.

The blackbird, which, in cold countries, and particularly upon the Alps, is sometimes seen all over white, is a beautiful and canorous bird, whistling all the spring and summer time with a note, at a distance the most pleasing of all the grove. It is the deepest toned warbler of the woods; but it is rather unpleasant in a cage, being loud and deafening. It lays four or five bluish eggs, in a nest usually built at the stump of some old hawthorn, well plastered on the inside with clay, straw, and hair.

Pleasing, however, as this bird may be, the bluebird, described by Bellonius, is in every respect far superior. This beautiful animal entirely resembles the blackbird in all but its blue colour. It lives in the highest parts of the Alps, and even there chooses the most craggy rocks and the most frightful precipices for its residence. As it is rarely caught, it is in high estimation even in the countries where it breeds, but still more valuable when carried from home. It not only whistles in the most delightful manner, but speaks with an articulate distinct voice. It is so docile, and observes all things with such diligence, that though waked at midnight by any of the family, it will speak and whistle at the word of command. In colour about the be-



Titmouse, p. 141.

Water Wagtail, p. 140.

Skylark, p. 143.

Mocking Bird, p. 145.

Wheatear, p. 142.

Water Ouzel, p. 144.

To face p. 144, vol. iii.

ginning of winter, from blue becomes black, which changes to its original hue on the first approaches of spring. It makes its nest in deep holes, in very high and inaccessible solitudes, and removes it not only from the accesses of man, but also hides it with surprising cunning from the chammois and other wild beasts that might annoy its young.

The manner of taking this beautiful bird is said to be this:—The fowlers, either by chance or by lying in wait, having found out the place where it builds, take with them a strong stilt or stake, such as the climbers of rocks make use of to assist them in their descent With the assistance of this, they mount where an indifferent spectator would think it impossible to ascend, covering their heads at the same time to ward off any danger of the falling of pebbles or stones from above. At length, with extreme toil and danger, having arrived at the nest, they draw it up from the hole in which it is usually buried, and cherish the young with an assiduity equal to the pains they took to obtain them. It produces for the most part five young, and never more; it seldom descends into the plain country, flies swifter than a blackbird, and uses the same food.

The Fieldfare and the Redwing make but a short stay in this country. With us they are insipid tuneless birds, flying in flocks, and excessively watchful to preserve the general safety. All their season of music and pleasure is employed in the more northern climates, where they sing most delightfully, perched among the forests of maples, with which those countries abound. They build their nests in hedges, and lay six bluish-green eggs spotted with black.

The Stare, distinguishable from the rest of this tribe by the glossy green of its feathers, in some lights, and the purple in others, breeds in hollow trees, eaves of houses, towers, ruins, cliffs, and often in high rocks over the sea. It lays four or five eggs of a pale greenish ash-colour, and makes its nest of straw, small fibres of roots, and such like. Its voice is rougher than the rest of this kind; but what it wants in the melody of its note, it compensates by the facility with which it is taught to speak. In winter these birds assemble in vast flocks, and feed upon worms and insects. At the approach of spring they assemble in fields, as if in consultation together, and for three or four days seem to take no nourishment: the greater part leave the country, the rest breed here and bring up their young.

To this tribe might be added above a hundred other birds of nearly the thrush size, and living like them upon fruit and berries. Words could not afford variety enough to describe all the beautiful tints that adorn the foreign birds of the thrush kind. The brilliant green of the emerald, the flaming red of the ruby, the purple of the amethyst, or the bright blue of the sapphire, could not, by the most artful combination, show any thing so truly lively or delightful to the sight as the feathers of the chilcoqui or the tautotol. Passing therefore over these beautiful, but little known birds, I will only mention the American mock-bird, the favourite songster of a region where the birds excel rather in the beauty of their plumage than the sweetness of their notes.

This valuable bird does not seem to vie with the feathered inhabitants of that country in the beauty of its plumage, content with qualifica tions that endear it to mankind much more. It is but a plain bird to the eye, about the size of a thrush, of a white and grey colour, and a reddish bill. It is possessed not only of its own natural notes, which are musical and solemn, but it can assume the tone of every other animal in the wood, from the wolf to the raven. It seems even to sport itself in leading them astray. It will at one time allure the lesser birds with the call of their males, and then terrify them when they have come near, with the screams of the eagle. There is no bird in the forest but it can mimic, and there is none that it has not at times deceived by its call. But not like such as we usually see tamed for mimicking with us, and who have no particular merit of their own, the mock-bird is ever surest to please when it is most itself. At those times it usually frequents the houses of American planters, and sitting all night on the chimney-top, pours forth the sweetest and the most various notes of any bird whatever. It would seem, if accounts be true, that the deficiency of most other song-birds in that country, is made up by this bird alone. They often build their nests in the fruit-trees about houses, feed upon berries and other fruits, and are easily rendered domestic.

CHAPTER III.

OF THE NIGHTINGALE AND OTHER SOFT-BILLED SONG-BIRDS

THE Nightingale is not only famous among the moderns for its singing, but almost every one of the ancients, who undertook to describe beautiful Nature, has contributed to raise its reputation. "The nightingale," says Pliny, "that, for fifteen days and nights, hid in the thicket shades, continues her note without intermission, deserves our attention and wonder. How surprising that so great a voice can reside in so small a body! such perseverance in so minute an animal! With what a musical propriety are the sounds it produces modulated! The note at one time drawn out with a long breath, now stealing off into a different cadence, now interrupted by a break, then changing into a new note by an unexpected transition, now seeming to renew the same strain, then deceiving expectation! She sometimes seems to murmur within herself; full, deep, sharp, swift, drawling, trembling; now at the top, the middle, and the bottom of the scale! In short, in that little bill seems to reside all the melody which man has vainly laboured to bring from a variety of musical instruments. Some even seem to be possessed of a different song from the rest, and contend with each other with great ardour. The bird overcome is then seen only to discontinue its song with its life."

This most famous of the feathered tribe visits England in the beginning of April, and leaves us in August. It is found but in some of the southern parts of the country, being totally unknown in Scot land, Ireland, or North Wales. They frequent thick hedges and low coppices, and generally keep in the middle of the bush, so that they are rarely seen. They begin their song in the evening, and generally continue it for the whole night. For weeks together, if undisturbed, they sit upon the same tree; and Shakespeare rightly describes the nightingale sitting nightly in the same place, which I have frequently observed she seldom departs from.

From Pliny's description, we should be led to believe this bird possessed of a persevering strain; but, though it is in fact so with the nightingale in Italy, yet in our hedges in England the little songstress is by no means so liberal of her music. Her note is soft, various, and interrupted; she seldom holds it without a pause above the time that one can count twenty. The nightingale's pausing song would be the proper epithet for this bird's music with us, which is more pleasing than the warbling of any other birds, because it is heard at a time when all the rest are silent.

In the beginning of May, the nightingale prepares to make its nest, which is formed of the leaves of trees, straw, and moss. The nest being very eagerly sought after, is as cunningly secreted; so that but very few of them are found by the boys when they go upon these pursuits. It is built at the bottom of hedges, where the bushes are thickest and best covered. While the female continues sitting, the male at a good distance, but always within hearing, cheers the patient hour with his voice, and, by the short interruption of his song, often gives her warning of approaching danger. She lays four or five eggs; of which but a part in our cold climate come to maturity.

The delicacy, or rather the fame, of this bird's music, has induced many to abridge its liberty to be secured of its song. Indeed, the greatest part of what has been written concerning it in our country, consists in directions how to manage it for domestic singing; while the history of the bird is confined to dry receipts or fitting it to the cage. Its song however, in captivity, is not so very alluring; and the tyranny of taking it from those hedges where only it is most pleasing, still more depreciates its imprisoned efforts. Gesner assures us, that it is not only the most agreeable songster in a cage, but that it is possessed of a most admirable faculty of talking. He tells the following story in proof of his assertion, which he says was communicated to him by a friend. "Whilst I was at Ratisbon," says his correspondent. "I put up at an inn, the sign of the Golden Crown, where my host had three nightingales. What I am going to repeat is wonderful, almost incredible, and yet is true. The nightingales were placed separately, so that each was shut up by itself in a dark cage It happened at that time, being the spring of the year, when those birds are wont to sing indefatigably, that I could sleep but very little all night. It was usual then about midnight, when there was no noise in the house, but all still, to hear the two nightingales jangling and talking with each other, and plainly imitating men's discourses. For my part I was almost astonished with wonder, for at this time, when all was quiet else, they held conference together, and repeated whatever they had heard among the guests by day. Those two of them that were most notable, and masters of this art, were scarce ten feet distant from another The third hung more remote, so that I could not so well hear it as I lay abed. But it is wonderful to tell how those two provoked each other, and by answering, invited and drew one another to speak. Yet did they not confound their words or talk both together, but rather utter them alternately and of course. Besides the daily discourse of the guests, they chaunted out two stories, which, generally held them from midnight till morning, and that with such modulations and inflections, that no man could have taken to come from such creatures. When I asked the host if they had been taught, or whether he observed their talking in the night, he answered no; the same said the whole family. But I, who could not sleep for nights together, was perfectly sensible of their discourse. One of their stories was concerning the tapster and his wife, who refused to follow him to the wars, as he desired her: For the husband endeavoured to persuade his wife, as far as I understood by the birds, that he would leave his service in that inn, and go to the wars in hopes of plunder. But she refused to follow him, resolving to stay either at Ratisbon, or go to Nuremberg. There was a long and earnest contention between them, and all this dialogue the birds repeated. They even repeated the unseemly words which were cast out between them, and which ought rather to have been suppressed and kept a secret. But the birds, not knowing the difference between modest, immodest, honest, and filthy words, did out with them. The other story was concerning the war which the emperor was then threatening against the Protestants, which the bird probably heard from some of the generals that had conferences in the house. These things did they repeat in the night after twelve o'clock, when there was a deep silence. But in the day-time, for the most part they were silent, and seemed to do nothing but meditate and revolve with themselves upon what the guests conferred together as they sat at table, or in their walks. I verily had never believed our Pliny, writing so many wonderful things concerning these little creatures, had I not myself seen with my eyes, and heard them with my ears uttering such things as I have related. Neither yet can I of a sudden write all, or call to remembrance every particular that I have heard."

Such is the sagacity ascribed to the nightingale; it is but to have high reputation for any one quality, and the world is ready enough to give us fame for others to which we have very small pretensions. But there is a little bird, rather celebrated for its affection to mankind than its singing, which however, in our climate, has the sweetest note of all others. The reader already perceives that I mean the RED-BREAST, the well-known friend of man, that is found in every hedge, and makes it vocal. The note of other birds is louder, and their inflexions more capricious, but this bird's voice is soft, tender, and well supported, and the more to be valued as we enjoy it the greatest part of the winter. If the nightingale's song has been compared to the fiddle, the red-breast's voice has all the delicacy of the flute.

The red-breast, during the spring, haunts the wood, the grove, and the garden. It retires to the thickest and shadiest hedge-rows to breed in. But in winter it seems to become more domestic, and often to claim protection from man. Most of the soft-billed birds, the nightingale, the swallow, and the tit-mouse, leave us in the winter when their insect food is no longer offered in plenty, but the redbreast continues with us the year round, and endeavours to support the famine of the winter by chirping round the warm habitations of mankind, by coming into those shelters where the rigour of the season is artificially expelled, and where insects themselves are found in greater numbers, attracted by the same cause.

This bird breeds differently in different places: in some countries its nest is usually found in the crevice of some mossy bank, or at the foot of a hawthorn in hedge-rows; in others it chooses the thickest coverts, and hides its nest with oak leaves. The eggs are from four to five, of a dull white, with reddish streaks.

The Lark, whether the sky-lark, the wood, or the tit-lark, being all distinguishable from other little birds by the length of their heel, are louder in their song than either of the former, but not so pleasing. Indeed, the music of every bird in captivity produces no very pleasing sensations; it is but the mirth of a little animal, insensible of its unfortunate situation; it is the landscape, the grove, the golden break of day, the contest upon the hawthorn, the fluttering from branch to branch, the soaring in the air, and the answering of its young, that gives the bird's song its true relish. These united improve each other, and raise the mind to a state of the highest, yet most harmless exultation. Nothing can, in this situation of mind, be more pleasing than to see the lark warbling upon the wing, raising its note as it soars, until it seems lost in the immense heights above us, the note continuing, the bird itself unseen; to see it then descending with a swell as it comes from the clouds, yet sinking by degrees as it approaches its nest; the spot where all its affections are centered; the spot that has prompted all this joy.

The lark builds its nest upon the ground, beneath some turf that serves to hide and shelter it. The female lays four or five eggs of a dusky hue in colour, somewhat like those of a plover. It is while she is sitting that the male thus usually entertains her with his singing, and while he is rising to an imperceptible height, yet he still has his loved partner in his eye, nor once loses sight of the nest either while he ascends or is descending. This harmony continues several months, beginning early in the spring on pairing. In winter they assemble in flocks, when their song forsakes them, and the bird-catchers destroy them in great numbers for the tables of the luxurious.

The Black-cap and the Wren, though so very diminutive, are yet prized by some for their singing. The former is called by some the mock-nightingale, and the latter is admired for the loudness of its note, compared to the little body from whence it issues. It must be confessed that this disproportion between the voice of a bird and its size, in some measure demands our wonder. Quadrupeds in this respect may be considered as mutes to them. The peacock is louder than the lion, and the rabbit is not so loud as the wren. But it must be considered that birds are very differently formed; their lungs in some measure are extended through their whole body, while in quadrupeds they lie only in the breast. In birds there are a variety of cells which take in the air, and thus pour forth their contents at the little animal's command. The black-cap and the wren, therefore are as respectable for their voices as they might be deemed inconsiderable for their size.

All these soft-billed birds, thus prized for their singing, are rendered domestic, and brought up with assiduity by such as are fond of their voices in a cage. The same method of treatment serves for all, as their food and their habits are nearly the same. The manner of taking and treating them, particularly the nightingale, is this. A nightingale's nest may be found by observing the place where the male sings, and then by sticking two or three mealworms (a kind of maggot found in flour) on some neighbouring thorn, which when he sees he will infallibly bear away to his young. By listening he then may be heard with the female chirping to the young ones while they are feeding. When the nest is found, if the young are not fledged enough to be taken, they must not be touched with the hands, for then the old ones will perceive it, and entice them away. They should not be taken till they are almost as full of feathers as the old ones; and though they refuse their meat, yet by opening their bills, you may give them two or three small bits at a time, which will make them soon grow tame, when they will feed themselves. They should be put, nest and all, into a little basket, which should be covered up warm, and they should be fed every two hours. Their food should be sheep-hearts, or other raw flesh meat, chopped very fine, and all the strings, skins, and fat taken away. But it should always be mixed with hen's eggs, boiled hard, upon which they will feed and thrive abundantly.

They should then be put in cages, like the nightingale's back cage, with a little straw or dry moss at the bottom; but when they are grown large they should have ants' mould. They should be kept very clean, as indeed should be all singing-birds whatsoever, for otherwise they will have the cramp, and perhaps the claws will drop off. In autumn they will sometimes abstain from their food for a fortnight, unless two or three meal-worms be given them twice or thrice a week, or two or three spiders in a day: they must likewise have a little saffron in their water. Figs chopped small among their meat will help them to recover their flesh. When their legs are cramped, they should be anointed with fresh butter, or capon's fat, three or four days together. If they grow melancholy, put white sugar-candy into their water, and feed them with sheep-heart, giving them three or four meal-worms in a day, and a few ants with their eggs. They should also have saffron in the water.

With regard to adult birds, those that are taken before the twenty-third of April are accounted the best, because after that they begin to pair. They usually haunt woods, coppices, and quickset hedges, where they may be taken in trap-cages baited with meal-worms. They should be placed as near the spot where the bird sings as possible; and before you fix the trap, turn up the earth twice the breadth of the cage, because they will there look for food. They are also taken with lime twigs, placing them upon the hedge where they usually sing; and there should be meal-worms stuck at proper places to draw them into the snare. After they are taken, their wings should be gently tied with thread, to prevent their beating themselves against the cage. This should be first hung in a private place, that the bird may not be disturbed; and it should be fed every two hours, at farthest, with sheep-heart and egg minced very fine, mixing it with meal-worms However, the first food must be worms, ants, caterpillars, and flies You must, to feed the bird, take it in your hand, and open the bill with a stick made thick at one end, giving it the insect, or four or five bits of food as big as peas, to entice it to eat. Its common food should be mixed with ants, so that when the bird goes to pick up the ants, it may pick up some of that also. The nightingale, when caged, begins to sing about the latter end of November, and continues its song till June.

CHAPTER IV.

OF THE CANARY-BIRD AND OTHER HARD-BILLED SINGING-BIRDS.

THE Canary-bird is now become so common, and has continued so long in a domestic state, that its native habits, as well as its native country, seem almost forgotten. Though by the name, it appears that these birds came originally from the Canary Islands, yet we have it only from Germany, where they are bred up in great numbers, and sold into different parts of Europe. At what period they were brought into Europe is not well known; but it is certain that about a century ago they were sold at very high prices, and kept only for the amusement of the great. They have since been multiplied in great abundance; and their price is diminished in proportion to their plenty.

In its native islands, a region equally noted for the beauty of its landscapes and the harmony of its groves, the Canary-bird is of a dusky gray colour, and so different from those usually seen in Europe. that some have even doubted whether it be of the same species. With us, they have that variety of colouring usual in all domestic fowls; some white, some mottled, some beautifully shaded with green; but they are more esteemed for their note than their beauty, having a high piercing pipe, as indeed all those of the finch tribe have, continuing for some time in one breath without intermission, then raising it higher and higher by degrees, with great variety.

It is this that has rendered the Canary-bird, next to the nightingale, the most celebrated songster; and, as it is more easily reared than any of the soft-billed birds, and continues its song throughout the year, it is rather the most common in our houses. Rules, therefore, have been laid down, and copious instructions given, for breeding these birds in a domestic state; which, as a part of them may conduce towards the natural history of the bird, I will take leave to transcribe.

In choosing the Canary-bird, those are best that appear with life and boldness, standing upright upon the perch, like a sparrow-hawk, and not apt to be frighted at every thing that stirs. If its eyes look cheerful and not drowsy, it is a sign of health; but on the contrary, if it hides its head under the wing, gathers its body up, these are symptoms of its being out of order. In choosing them, the melody of the song should also be minded: some will open with the notes of the nightingale, and running through a variety of modulations, end like the tit-lark. Others will begin like the sky-lark, and, by a soft melodious turn, fall into the notes of the nightingale. These are lessons taught this bird in its domestic state, and generally taught it by others; but its native note is loud, shrill, piercing, and enough to deafen the hearers. There are persons who admire each of these songs but the second is in the most general estimation. .

Canary-birds sometimes breed all the year round; but they most usually begin to pair in April, and to breed in June and August. Those are said to be the best breeders that are produced between the English and the French.

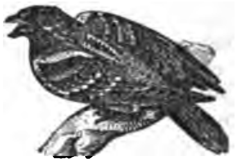
Towards the latter end of March, a cock and hen should be put together in a small cage where they will peck at each other in the beginning, but will soon become thoroughly reconciled. The room where they are kept to breed, should be so situated as to let the birds have the benefit of the morning sun, and the windows should be of wire, not glass, that they may enjoy the benefit of the air. The floor of the room should be kept clean, and sometimes there should be dry gravel or sand sifted upon it. There should also be two windows, one at each end, and several perches at proper distances for the birds to settle on, as they fly backwards and forwards. A tree in the middle of the room would be the most convenient to divert the birds, and sometimes to serve for building their nests upon.

In Germany they prepare a large room, and build it in the manner of a barn, being much longer than broad, with a square place at each end, and several holes to go into those square places. In those outlets they plant several sorts of trees, in which the birds take great delight to sing and breed. The bottom of the place they strew with sand, and upon it cast rape-seed, chick-weed, and groundsel, which the old birds feed upon while breeding. In the body of the house they put all sorts of stuffs for building the nest, and brooms, one under the other, in all the corners, for the birds to build in. These they separate by partitions from each other, to prevent those above flying down upon, or otherwise incommoding such as breed below. The light also is excluded, for no bird is fond of having light come to its nest.

With us the aparatus for breeding is less expensive; a little breeding cage sometimes suffices, but seldom any thing more extensive than a small room. While the birds are pairing, it is usual to feed them with soft meat; that is bread, maw-seed, a little scalded rape-seed, and near a third part of an egg. The room should be furnished with stuff for making their nests; such as fine hay, wool, cotton, and hair. These materials should be thoroughly dry, and then mixed and tied together in such a manner that the birds may readily pull out what they want. This should be hung in a proper part of the room, and the male will take his turn in building the nest, sitting upon the eggs, and feeding the young. They are generally two or three days in building their nests; the hen commonly lays five eggs; and in the space of fourteen days the young will be excluded. So prolific are these birds sometimes, that the female will be ready to hatch

Night Heron, p. 179.

Spoonbill, p. 175.



Goat-Sucker, p. 153.

Heron, p. 170.

Balearic Crane p. 168.

To face p. 153, vol. iii.

a second brood before the first are able to quit the nest. On these occasions, she leaves the nest and the young to provide herself with another to lay her new brood in. In the mean time the male, more faithful to the duties of his trust, breeds up the young left behind, and fits them for a state of independence.

When the young ones are excluded, the old ones should be supplied with a sufficiency of soft food every day, with likewise fresh greens, such as cabbage, lettuce, and chick-weed; in June, shepherd's purse; and in July and August, plantain. They are never to have groundsel after the young are excluded. With these different delicacies, the old ones will take particular care to feed and bring up their young; but it is usual when they can feed themselves, to be taken from the nest and put into cages. Their meat then is the yolk of an egg boiled hard, with an equal quantity of fine bread, and a little scalded rape-seed: this must be bruised till it becomes fine, and then it may be mixed with a little maw-seed; after which blend all together; which is to be supplied them fresh every day.

The Canary-bird, by being kept in company with the linnet or the goldfinch, pairs and produces a mixed breed, more like the Canary-bird, and resembling it chiefly in its song. Indeed all this tribe with strong bills and piercing notes, and feeding upon grain, have the most strong similitude to each other, and may justly be supposed, as Mr. Buffon imagines, to come from the same original. They all breed about the same time; they frequent the same vegetables; they build in the same hedges and trees; and are brought up for the cage with the same food and precautions. The linnet, the bullfinch, and the goldfinch, when we know the history of the Canary-bird, have scarce any peculiarities that can attract our curiosity, or require our care. The only art necessary with all those that have no very fine note, is to breed them up under some more pleasing harmonist.—The goldfinch learns a fine song from the nightingale; and the linnet and bullfinch may be taught, forgetting the wild notes of Nature, to whistle long and regular tune.

CHAPTER V.

OF THE SWALLOW AND ITS AFFINITIES.

AN idea of any one bird in the former classes will give us som olerable conception of the rest. By knowing the linnet or the Cana y-bird, we have some notion of the manners of the goldfinch; by ex hibiting the history of the nightingale, we see also that of the black cap or the titmouse. But the swallow tribe seems to be entirely dif erent from all the former: different in their form, different in their abits, and unlike in all the particulars of their history.

In this tribe is to be found the Goat-sucker which may be styled a nocturnal swallow; it is the largest of this kind, and is known by its tail, which is not forked, like that of the common swallow. It begins its flight at evening, and makes a loud singular noise, like the whirl of a spinning wheel. To this also belongs the House-swallow, which is too well known to need a description; the Martin, inferior in size to the former, and the tail much less forked; it differs also in its nest, which is covered at top, while that of the house-sparrow is open; and the Swift, rather larger than the house-swallow, with all the toes standing forward; in which it differs from the rest of its kind. All these resemble each other so strongly, that it is not without difficulty the smaller kinds are known asunder.

These are all known by their very large mouths, which, when they fly, are always kept open; they are not less remarkable for their short, slender feet, which scarce are able to support the weight of their bodies; their wings are of immoderate extent for their bulk; their plumage is glossed with a rich purple; and their note is a slight twittering, which they seldom exert but upon the wing.

This peculiar conformation seems attended with a similar peculiarity of manners. Their food is insects, which they always pursue flying. For this reason, during fine weather, when the insects are most likely to be abroad, the swallows are for ever upon the wing, and seem pursuing their prey with amazing swiftness and agility. All smaller animals, in some measure, find safety by winding and turning, when they endeavour to avoid the greater: the lark thus evades the pursuit of the hawk, and the man the crocodile. In this manner, insects upon the wing endeavour to avoid the swallow; but this bird is admiralby fitted by Nature to pursue them through their shortest turnings. Besides a great length of wing, it is also provided with a long tail, which, like a rudder, turns it in its most rapid motions; and thus, while it is possessed of the greatest swiftness, it is also possessed of the most extreme agility.

Early, therefore, in the spring, when the returning sun begins to rouse the insect tribe from their annual state of torpidity; when the gnat and the beetle put off their earthly robes and venture into air, the swallow then is seen returning from its long migration beyond the ocean, and making its way feebly to the shore. At first with the timidity of a stranger, it appears but seldom, and flies but slowly and heavily along. As the weather grows warmer, and its insect supply increases, it then gathers greater strength and activity. But it sometimes happens that a rainy season, by repelling the insects, stints the swallow in its food; the poor bird is then seen slowly skimming along the surface of the ground, and often resting after a flight of a few minutes. In general, however, it keeps on the wing, and moving with a rapidity that nothing can escape. When the weather promises to be fair, the insect-tribe feel the genial influence, and make bolder flights; at that time the swallow follows them in their aerial journeys, and often rises to imperceptible heights in the pursuit. When the weather is likely to be foul, the insects feel the first notices of it; and from the swallow's following low we are often apprized of the approaching change.

When summer is fairly begun, and more than a sufficient supply for sustaining the wants of nature every where offers, the swallow then begins to think of forming a progeny. The nest is built with great industry and art, particularly by the common swallow, which builds it on the tops of chimneys. The martin sticks it to the eaves of houses. The goat-sucker, as we are told, builds it on the bare ground. This nest is built with mud from some neighbouring brook, well tempered with the bill, moistened with water, for the better adhesion; and still farther kept firm, by long grass and fibres; within it is lined with goose feathers, which are ever the warmest and the neatest. The martin covers its nest at top, and has a door to enter at; the swallow leaves her's quite open. But our European nests are nothing to be compared with those the swallow builds on the coasts of China and Coromandel; the description of which I will give in the plain, honest phrase of Willoughby. "On the sea-coast of the kingdom of China," says he, "a sort of party-coloured birds, of the shape of swallows, at a certain season of the year, which is their breeding time, come out of the mid-land country to the rocks, and from the foam or froth of the sea-water, dashing against the bottom of the rocks, gather a certain clammy, glutinous matter, perchance the spawn of whales or other young fishes, of which they build their nests, wherein they lay their eggs and hatch their young. These nests the Chinese pluck from the rocks, and bring them in great numbers into the East Indies to sell. They are esteemed, by gluttons, as great delicacies; who, dissolving them in chicken or mutton broth, are very fond of them; far before oysters, mushrooms, or other dainty and liquorish morsels." What a pity this luxury hath not been introduced among us, and then our great feasters might be enabled to eat a little more!

The swallow usually lays from five to six eggs, of a white colour, speckled with red; and sometimes breeds twice a year. When the young brood are excluded, the swallow supplies them very plentifully, the first brood particularly, when she finds herself capable of producing two broods in a year. This happens when the parents come early, when the season is peculiarly mild, and when they begin to pair soon. Sometimes they find a difficulty in rearing even a single nest, particularly when the weather has been severe, or their nests have been robbed in the beginning of the season. By these accidents, this important task is sometimes deferred to the middle of September.

At the latter end of September, they leave us; and for a few days previous to their departure, assemble in vast flocks, on house tops, as if deliberating on the fatiguing journey that lay before them. This is no slight undertaking, as their flight is directed to Congo, Senegal, and along the whole Morocco shore. There are some, however, left behind in this general expedition, that do not part till eight or ten days after the rest These are chiefly the latter weakly broods which are not yet in a condition to set out. They are sometimes even too feeble to venture, till the setting in of winter; while their parents vainly exhort them to efforts which instinct assures them they are incapable of performing. Thus it often happens, that the wretched little families, being compelled to stay, perish the first cold weather that comes; while the tender parents share the fate of their offspring, and die with their new-fledged brood.

Those that migrate, are first observed to arrive in Africa, as Mr Adanson assures us, about the beginning of October. They are thought to have performed their fatiguing journey in the space of seven days. They are sometimes seen, when interrupted by contrary winds, wavering in their course far off at sea, and lighting upon whatever ship they find in their passage. They then seem spent with famine and fatigue; yet still they boldly venture, when refreshed by a few hours rest, to renew their flight, and continue the course which they had been steering before

These are facts, proved by incontestible authority; yet it is a doubt whether all swallows migrate in this manner, or whether there may not be some species of this animal that, though extremely alike, are so internally different, as to be very differently affected by the approach of winter. We are assured from many, and these not contemptible witnesses, that swallows hide themselves in holes under ground, joined close together, bill against bill, and feet against feet. Some inform us that they have seen them taken out of the water, and even from under the ice, in bunches, where they are asserted to pass the winter, without motion. Reaumur, who particularly interested himself in this inquiry, received several accounts of bundles of swallows being thus found in quarries, and under the water. These men, therefore, have a right to some degree of assent; and are not to lose all credit from our ignorance of what they aver.

All, however, that we have hitherto dissected, are formed within like other birds; and seem to offer no observable variety. Indeed, that they do not hide themselves under water, has been pretty well proved, by the noted experiments of Frisch, who tied several threads died in water-colours, round the legs of a great number of swallows that were preparing for their departure: these, upon their return the ensuing summer, brought their threads back with them, no way damaged in their colour; which they most certainly would, if, during the winter, they had been steeped in water: yet still this is a subject on which we must suspend our assent, as Klein, the naturalist, has brought such a number of proofs in defence of his opinion, that swallows are torpid in winter, as even the most incredulous must allow to have some degree of probability.

CHAPTER VI.

OF THE HUMMING-BIRD, AND ITS VARIETIES.

HAVING given some history of the manners of the most remarkable birds of which accounts can be obtained, I might now go to a very extensive tribe, remarkable for the splendour and the variety of their plumage: but the description of the colours of a beautiful bird, has nothing in it that can inform or entertain; it rather excites a longing, which it is impossible for words to satisfy. Naturalists, indeed, have endeavoured to satisfy this desire, by coloured prints; but, beside that these at best give only a faint resemblance of Nature, and are a very indifferent kind of painting, the bird itself has a thousand beauties, that the most exquisite artist is incapable of imitating. They, for instance, who imagine they have a complete idea of the beauty of the little tribe of Manikin birds, from the pictures we have of them, will find themselves deceived, when they compare their draughts with Nature. The shining greens, the changeable purples. and the glossy reds, are beyond the reach of the pencil; and very far beyond the coloured print, which is but a poor substitute for painting. I have therefore declined entering into a minute description of foreign birds of the sparrow kind; as sounds would never convey an adequate idea of colours.

There is one species, however, that I will conclude the history of this class with; as, though the least, it will certainly be allowed the most beautiful of all others. In quadrupeds, the smallest animals are noxious, ugly, and loathsome; the smallest of birds are the most beautiful, innocent, and sportive. Of all those that flutter in the garden, or paint the landscape, the Humming-bird is the most delightful to look upon, and the most inoffensive.

Of this charming little animal, there are six or seven varieties, from the size of a small wren, down to that of an humble-bee. An European could never have supposed a bird existing so very small, and yet completely furnished out with a bill, feathers, wings, and intestines, exactly resembling those of the largest kind. A bird not so big as the end of one's little finger, would probably be supposed but a creature of imagination, were it not seen in infinite numbers, and as frequent as butterflies in a summer's day, sporting in the fields of America, from flower to flower, and extracting their sweet with its little bill.

The smallest humming-bird is about the size of a hazel-nut. The feathers on its wings and tail are black; but those on its body, and under its wings, are of a greenish brown with a fine red cast, or gloss, which no silk or velvet can imitate. It has a small crest on its head, green at the bottom, and, as it were, gilded at the top; and which sparkles in the sun like a little star in the middle of its forehead. The bill is black, straight, slender, and of the length of a small pin. The larger humming-bird is near half as big as the common wren, and without a crest on its head; but, to make amends, it is covered, from the throat half way down the belly, with changeable crimson-coloured feathers, that, in different lights, change to a variety of beautiful colours, much like an opal. The heads of both are small, with very little round eyes as black as jet.

It is inconceivable how much these add to the high finishing and beauty of a rich and luxurious western landscape. As soon as the sun is risen, the humming-birds of different kinds are seen fluttering about the flowers, without ever lighting upon them. Their wings are in such rapid motion, that it is impossible to discern their colours, except by their glittering. They are never still, but continually in motion, visiting flower after flower, and extracting its honey as it with a kiss. For this purpose they are furnished with a forky tongue that enters the cup of the flower, and extracts its nectared tribute. Upon this alone they subsist. The rapid motion of their wings brings out a humming sound, from whence they have their names; for whatever divides the air swiftly, must thus produce a murmur.

The nests of these birds are not less curious than the rest: they are suspended in the air, at the point of the twigs of an orange, a pomegranate, or a citron-tree: sometimes even in houses, if they find a small and convenient twig for the purpose. The female is the architect, while the male goes in quest of materials, such as cotton, fine moss, and the fibres of vegetables. Of these materials a nest is composed of about the size of a hen's egg cut in two, admirably contrived, and warmly lined with cotton. They lay two eggs at a time, and never more, about the size of small peas, and as white as snow, with here and there a yellow speck. The male and the female sit upon the nest by turns; but the female takes to herself the greatest share. She seldom quits the nest, except a few minutes in the morning and evening, when the dew is upon the flowers, and their honey in perfection. During this short interval, the male takes her place; for, as the egg is so small, the exposing it ever so short a time to the weather, would be apt to injure its contents, the surface exposed being so great in comparison to the bulk. The time of incubation continues twelve days, at the end of which the young ones appear, much about the size of a blue-bottle fly. They are at first bare; by degrees they are covered with down, and at last feathers succeed, but less beautiful at first than those of the old ones.

"Father Labat's companion in the mission to America, found the nest of a humming-bird, in a shed that was near the dwelling-house, and took it in at a time when the young ones were about fifteen or twenty days old; he then placed them in a cage at his chamber-window, to be amused by their sportive flutterings; but he was soon surprised to see the old ones, that came and fed their brood regularly every hour in the day. By these means they themselves soon grew so tame that they seldom quitted the chamber; but, without any constraint, came to live with their young ones. All four have frequently come to perch upon their master's hand, chirruping as if they had been at liberty abroad. He fed them with a very fine clear paste made of wine, biscuit, and sugar: they thrust their tongues into this paste till they were satisfied, and then fluttered and chirruped about the room. I never beheld any thing more agreeable," continues he, "than this lovely little family that had taken possession of my companion's chamber, and that flew out and in just as they thought proper, but were ever attentive to the voice of their master, when he called them. In this manner they lived with him for above six months, but at a time when he expected to see a new colony formed, he unfortunately forgot to tie up their cage to the ceiling at night, to preserve them from the rats, and he found they were devoured in the morning."

These birds, on the continent of America, continue to flutter the year round, as their food, which is the honey of flowers, never forsakes them in those warm latitudes where they are found. But it is otherwise in the islands of the Antilles, where, when the winter season approaches, they retire, and, as some say, continue in a torpid state during the severity of that season At Surinam and Jamaica where they constantly have flowers, these beautiful birds are never known to disappear.

It is a doubt whether or not these birds have a continued note in singing. All travellers agree that, beside the humming noise produced by their wings, they have a little interrupted chirrup; but Labat asserts that they have a most pleasing melancholy melody in their voices, though small and proportioned to the organs which produce it. It is very probable that in different places their notes are also different; and as there are some that continue torpid all the winter, there may likewise be some with agreeable voices, though the rest may in general be silent.

The Indians formerly made great use of this pretty bird's plumage in adorning their belts and head-dress. The children take them in the fields upon rings smeared with bird-lime: they approach the place where the birds are flying, and twirling their rings in the air, so allure them, either by the colour or the sound, that the simple little creature comes to rest upon the ring, and is seized. They are then instantly killed and gutted, and hung up in the chimney to dry. Those who take greater care, dry them in a stove, which is not so likely to injure the plumage as the foregoing method. Their beautiful feathers were once the ornament of the highest rank of savage nobility, but at present they take the bird rather for the purpose of selling it as a curiosity to the Europeans, than that of ornament for themselves. All the taste for savage finery is wearing out fast, even among the Americans. They now begin to adopt, if not the dresses of Europe, at least the materials of which they are composed. The wandering warrior is far from thinking himself fine at present with his bow and his feathered crown: his ambition reaches to higher ornaments; a gun, a blue shirt, and a blanket.

BOOK VI.

OF BIRDS OF THE CRANE KIND.

CHAPTER I.

OF BIRDS OF THE CRANE KIND IN GENERAL.

THE progressions in Nature from one class of beings to another, are always by slow and almost imperceptible degrees. She has peopled the woods and the fields with a variety of the most beautiful birds; and, to leave no part of her extensive territories untenanted, she has stocked the waters with its feathered inhabitants also; she has taken the same care in providing for the wants of her animals in this element, as she has done with respect to those of the other: she has used as much precaution to render water-fowl fit for swimming, as she did in forming land-fowl for flight: she has defended their feathers with a natural oil, and united their toes by a webbed membrane, by which contrivances they have at once security and motion. But between the classes of land-birds that shun the water, and of water-fowl that are made for swimming and living on it, she has formed a very numerous tribe of birds, that seem to partake of a middle nature; that, with divided toes, seemingly fitted to live upon land, are at the same time furnished with appetites that chiefly attach them to the waters. These can properly be called neither land-birds nor water-fowl, as they provide all their sustenance from watery places, and yet are unqualified to seek it in those depths where it is often found in greatest plenty.

This class of birds, of the crane kind, are to be distinguished from others rather by their appetites than their conformation. Yet even in this respect they seem to be sufficiently discriminated by Nature: as they are to live among the waters, yet are incapable of swimming in them, most of them have long legs, fitted for wading in shallow waters, or long bills proper for groping in them.

Every bird of this kind, habituated to marshy places, may be known, if not by the length of its legs, at least by the scaly surface of them. Those who have observed the legs of a snipe or a wood cock, will easily perceive my meaning; and how different the surface of the skin that covers them is from that of the pigeon or the partridge. Most birds of this kind also, are bare of feathers half way up the thigh; at least, in all of them, above the knee. Their long habits

Adjutant, or Giant Crane. p. 168.

Bittern, p. 174.

Curlew, p. 182.

To face p. 160, vol. iii.

of wading in the waters, and having their legs continually in moisture, prevent the growth of feathers on those parts; so that there is a surprising difference between the legs of a crane, naked of feathers almost up to the body, and the falcon, booted almost to the very toes.

The bill also is very distinguishable in most of this class. It is, in general, longer than that of other birds, and in some finely fluted on every side; while at the point it is possessed of extreme sensibility, and furnished with nerves, for the better feeling their food at the bottom of marshes, where it cannot be seen. Some birds of this class are thus fitted with every convenience: they have long legs, for wading; long necks for stooping; long bills, for searching; and nervous points, for feeding. Others are not so amply provided for; as some have long bills, but legs of no great length? and others have long bills, but very short legs. It is a rule which universally holds, that wherever the bird's legs are long, the neck is also long in proportion. It would indeed be an incurable defect in the bird's conformation, to be lifted upon stilts above its food, without being furnished with an instrument to reach it.

If we consider the natural power of this class, in a comparative view they will seem rather inferior to those of every other tribe. Their nests are more simple than those of the sparrow; and their methods of obtaining food less ingenious than those of the falcon; the pie exceeds them in cunning; and though they have all the voraciousness of the poultry tribe, they want their fecundity. None of this kind, therefore, have been taken into man's society, or under his protection; they are neither caged, like the nightingale; nor kept tame, like the turkey; but lead a life of precarious liberty, in fens and marshes, at the edges of lakes, and along the sea-shore. They all live upon fish or insects, one or two only excepted; even those that are called *mud-suckers*, such as the snipe and the woodcock, it is more than probable, grope the bottom of marshy places only for such insects as are deposited there by their kind, and live in a vermicular state, in pools and plashes, till they take wing, and bocome flying insects.

All this class, therefore, that are fed upon insects, their food being easily digested, are good to be eaten; while those who live entirely upon fish, abounding in oil, acquire, in their flesh, the rancidity of their diet, and are, in general, unfit for our tables. To savages, indeed, and sailors on a long voyage, every thing that has life seems good to be eaten; and we often find them recommending those animals as dainties, which they themselves would spurn at, after a course of good living. Nothing is more common in their journals, than such accounts as these—— "This day we shot a fox—pretty good eating: this day we shot a heron—pretty good eating: and this day we killed a turtle—which they rank with the heron and the fox, as pretty good eating." Their accounts, therefore, of the flesh of these birds, are not to be depended upon; and when they cry up the heron or the stork of other countries as luxurious food, we must always attend to the state of their appetites who give the character.

In treating of this class of birds, it will be best to observe the simplest method possible; neither to load the memory with numerous distinctions, nor yet confuse the imagination by a total want of arrangement. I will therefore describe some of the largest sorts separately; as in a history of birds, each of these demands peculiar distinction. The crane, the stork, the Balearic crane, the heron, the bittern, with some others, may require a separate history. Some particular tribes may next offer, that may very naturally be classed together; and as for all the smaller and least remarkable sorts, they may be grouped into one general description.

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CHAPTER II.

THE CRANE.

THERE is something extraordinary in the different accounts we have of this bird's size and dimensions. Willoughby and Pennant make the Crane from five to six feet long, from the tip to the tail. Other accounts say, that it is above five feet high; and others, that it is as tall as a man. From the many which I myself had seen, I own this imputed magnitude surprised me; as from memory I was convinced, they could neither be so long nor so tall. Indeed, a bird, the body of which is not larger than that of a turkey-hen, and acknowledged on all hands not to weigh above ten pounds, cannot easily be supposed to be almost as long as an ostrich. Brisson, however, seems to give this bird its real dimensions, when he describes it as something less than the brown stork, about three feet high, and about four from the tip to the tail. Still, however, the numerous testimonies of its superior size are not to be totally rejected; and perhaps, that from which Brisson took his dimensions, was one of the smallest of the kind.

The crane, taking its dimensions from him, is exactly three feet four inches from the tip to the tail, and four feet from the head to the toe. It is a tall slender bird, with a long neck and long legs. The top of the head is covered with black bristles, and the back of it is bald and red, which sufficiently distinguishes this bird from the stork to which it is very nearly allied in size and figure. The plumage, in general, is ash-coloured; and there are two large tufts of feathers that spring from the pinion of each wing.—These bear a resemblance to hair, and are finely curled at the ends, which the bird has a power of erecting and depressing at pleasure. Gesner says, that these feathers, in his time, used to be set in gold, and worn as ornaments in caps.

Such are the dimensions of a bird, concerning which, not to mention modern times, there have been more fables propagated than of any other. It is a bird with which all the ancient writers are familiar; and, in describing it, they have not failed to mix imagination with history. From the policy of the cranes they say, we are to look for an idea of the most perfect republic amongst ourselves; from their tenderness to their decreped parents, which they take care to nourish to cherish, and support when flying, we are to learn lessons of filial piety; but particularly from their conduct in fighting with the pigmies of Ethiopia, we are to receive our maxims in the art of war In early times, the history of Nature fell to the lot of poets only, and certainly none could describe it so well; but it is a part of their province to embellish also; and when this agreeable science was claimed by a more sober class of people, they were obliged to take the accounts of things as they found them; and, in the present instance, fable ran down blended with truth to posterity.

In these accounts, therefore, there is some foundation of truth; yet much more has been added by fancy. The crane is certainly a very social bird, and they are seldom seen alone. Their usual method of flying or sitting, is in flocks of fifty or sixty together; and while a part feed, the rest stand like sentinels upon duty. The fable of their supporting their aged parents, may have arisen from their strict connubial affection; and as for their fighting with the pigmies, it may not be improbable but that they have boldly withstood the invasions of monkeys coming to rob their nests; for, in this case, as the crane lives upon vegetables, it is not probable that it would be the first aggressor.

However this be, the crane is a wandering, sociable bird, that, for the most part, subsists upon vegetables; and is known in every country of Europe, except our own. There is no part of the world says Bellonius, where the fields are cultivated, that the crane does not come in with the husbandman for a share in the harvest. As they are birds of passage, they are seen to depart, and return regularly at those seasons when their provision invites or repels them. They generally leave Europe about the latter end of autumn, and return in the beginning of summer. In the inland parts of the continent, they are seen crossing the country in flocks of fifty or a hundred, making from the northern regions towards the south. In these migrations, however, they are not so resolutely bent upon going forward, but that if a field of corn offers in their way, they will stop awhile to regale upon it: on such occasions they do incredible damage, chiefly in the night; and the husbandman, who lays down in joyful expectation, rises in the morning to see his fields laid entirely waste, by an enemy, whose march is too swift for his vengeance to overtake.

Our own country is free from their visits; not but that they were formerly known in this island, and held in great estimation for the delicacy of their flesh: there was even a penalty upon such as destroyed their eggs; but, at present, they never go so far out of their way Cultivation and populousness go hand in hand; and though our fields may offer them a great plenty, yet it is so guarded, that the birds find the venture greater than the enjoyment; and probably we are much better off by their absence than their company. Whatever their flesh might once have been, when, as Plutarch tells us, cranes were blinded and kept in coops, to be fattened for the tables of the great in Rome; or, as they were brought up, stuffed with mint and rue, to the tables of our nobles at home; at present, they are considered all over Europe as wretched eating. The flesh is fibrous and dry, requiring much preparation to make it palatable; and even after every art, it is fit only for the stomachs of strong and labouring people.

The cold Arctic region seems to be this bird's favourite abode. They come down into the more southern parts of Europe, rather as visitants than inhabitants: yet it is not well known in what manner they portion out their time, to the different parts of the world. The migrations of the fieldfare or thrush, are obvious, and well known; they go northward or southward, in one simple track; when their food fails them here, they have but one region to go to. But it is otherwise with the crane; he changes place, like a wanderer; he spends the autumn in Europe; he then flies off, probably to some more southern climate, to enjoy a part of the winter; returns to Europe in the spring; crosses up to the north in summer; visits those lakes that are never dry; and then comes down again to make depredations upon our cultivated grounds, in autumn. Thus Gesner assures us, that the cranes usually begin to quit Germany, from about the eleventh of September to the seventeenth of October; from thence they were seen flying southward by thousands; and Redi tells us they arrive in Tuscany a short time after. There they tear up the fields, newly sown, for the grain just committed to the ground, and do great mischief. It is supposed, that, in the severity of winter, they go southward, still nearer the line. They again appear in the fields of Pisa, regularly about the twentieth of February, to anticipate the spring.

In these jous ayrne, its imazing to conceive the heights to which they ascend, when they fly. Their note is the loudest of all other birds; and that is often heard in the clouds, when the bird itself is entirely unseen. As it is light for its size, and spreads a large expanse of wing, it is capable of floating at the greatest height, where the air is lightest; and as it secures its safety, and is entirely out of the reach of man, it flies in tracts which would be too fatiguing for any other birds to move forward in.

In these ærial journeys, though unseen themselves, they have the distinctest vision of every object below. They govern and direct their flight by their cries; and exhort each other to proceed or to descend, when a fit opportunity offers for depredation. Their voice, it was observed, is the loudest of all the feathered tribe; and its peculiar clangor arises from the very extraordinary length and contortion of the windpipe. In quadrupeds the windpipe is short, and the glottis, or cartilages that form the voice, are at that end of it which is next the mouth; in waterfowl, the wind-pipe is longer, but the cartilages that form the voice are at the other end, which lies down in their belly. By this means they have much louder voices, in proportion to their size, than any other animals whatever; for the note when formed below, is reverberated through all the rings of the windpipe, till it reaches the air But the voice of the duck or the goose is nothing to be compared to that of the crane, whose windpipe is not only made in the same manner with theirs, but is above twenty times as long. Nature seems to have bestowed much pains in lengthening out this organ. From the outside it enters through the flesh into the breastbone, which hath a great cavity within to receive it. There, being thrice reflected, it goes out again at the same hole, and so turns down to the lungs, and thus enters the body a second time. The loud clangorous sound which the bird is thus enabled to produce, is, when near, almost deafening: however, it is particularly serviceable to the animal itself, either during its migrations or its stay, by it the flock is encouraged in their journeys; and if, while they are feeding, which is usually performed in profound silence, they are invaded on any side, the bird that first perceives the danger, is sure to sound the alarm, and all are speedily upon the wing.

As they rise but heavily, they are very shy birds, and seldom let the fowler approach them. Their depredations are usually made in the darkest nights; at which time they enter a field of corn, and trample it down, as if it had been crossed over by a regiment of soldiers. On other occasions, they choose some extensive solitary marsh, where they range themselves all day, as if they were in deliberation; and not having that grain which is most to their appetites, wade the marshes for insects and other food, which they can procure with less danger.

Corn is their favourite food; but there is scarce any other that comes amiss to them. Redi, who opened several, found the stomach of one full of the herb called *dandelion;* that of another was filled with beans; a third had a great quantity of clover in its stomach; while that of two others was filled with earth-worms and beetles: in some he found lizards and sea-fish; in others snails, grass, and pebbles, swallowed perhaps for medical purposes. It seems, therefore, that these birds are easily supplied; and that they are noxious to cornfields but on some particular occasions.

In general it is a peaceful bird, both in its own society, and with respect to those of the forest. Though so large in appearance, a little falcon pursues, and often disables it. The method is, with those who are fond of hawking, to fly several hawks together against it; which the crane endeavours to avoid, by flying up perpendicularly, till the air becomes too thin to support it any higher. The hawk, however, still bears it company; and though less fitted for floating in so thin a medium, yet, possessed of greater rapidity, it still gains the ascendancy. They both often rise out of sight; but soon the spectator, who keeps his eye fixed above, perceives them, like two specks, beginning to appear: they gather on his eye for a little space, and shortly after come tumbling perpendicularly together, with great animosity, on the side of the hawk, and a loud screaming on that of the crane. Thus driven to extremity, and unable to fly, the poor animal throws itself upon its back, and, in that situation, makes a most desperate defence, till the sportsman coming up, generally puts an end to the contest with its life.

It was once the barbarous custom to breed up cranes to be thus baited; and young ones were taken from the nest, to be trained up for this cruel diversion. It is an animal easily tamed; and if we can believe Albertus Magnus, has a particular affection for man. This quality, however, was not sufficient to guard it from being made the victim of his fierce amusements. The female, which is easily distinguished from the male, by not being bald behind as he is, never lays above two eggs at a time; being like those of a goose, but of a bluish colour. The young ones are soon fit to fly and then the pa rents forsake them to shift for themselves; but before this time, they are led forth to the places where their food is most easily found. Though yet unfledged, they run with such swiftness that a man cannot easily overtake them. We are told, that as they grow old, their plumage becomes darker; and, as a proof of their longevity, Aldrovandus assures us, that a friend of his kept one tame for above forty years.

Whatever may have been the disposition of the great, the vulgar of every country, to this day, bear the crane a compassionate regard. It is possible the ancient prejudices in its favour, which once having been planted, are eradicated but slowly, may still continue to operate. In some countries, it is considered as an heinous offence to kill a crane; and though the legislator declines to punish, yet the people do not fail to resent the injury. The crane, they, in some measure, consider as the prophet of the season; upon its approach or delay they regulate the periods of their ural economy. If their favourite bird comes early in the season, they expect a plentiful summer; if he is slow in his visits, they then prepare for an unfavourable spring. Whatever wisdom there may be in despising the prejudices of the vulgar, there is but little in condemning them. They have generally had their origin in good motives; and it should never be our endeavours to suppress any tender emotions of friendship or pity, in those hard breasts that are, in general, unsusceptible of either.

CHAPTER III

THE STORK.

If we regard the Stork externally only, we shall be very apt to confound it with the crane. It is of the same size; it has the same formation as to the bill, neck, legs, and body, except that it is something more corpulent. Its differences are but very slight; such as the colour, which, in the crane, is ash and black, but in the stork, is white and brown. The nails of the toes of the stork also are very peculiar; not being clawed like those of other birds, but flat like the nails of man.

These, however, are but very slight differences; and its true distinctions are to be taken rather from its manners than its form. The crane has a loud piercing voice; the stork is silent, and produces no other noise than the clacking of its under-chap against the upper the crane has a strange convolution of the windpipe through the breast-bone; the stork's is formed in the usual manner: the crane feeds mostly upon vegetables and grain; the stork preys entirely upon frogs, fishes, birds, and serpents: the crane avoids towns and populous places; the stork lives always in or near them: the crane lays but two eggs, and the stork generally four. These are distinctions fully sufficient to mark the species, notwithstanding the similitude of their form.

Storks are birds of passage, like the former; but it is hard to say whence they come or whither they go. When they withdraw from Europe, they all assemble on a particular day, and never leave one of their company behind them. They take their flight in the night; which is the reason the way they go has never been observed. They generally return into Europe in the middle of March, and make their nests on the tops of chimneys and houses, as well as of high trees. The females lay from two to four eggs, of the size and colour of those of geese; and the male and female sit upon them by turns. They are a month in hatching; and when their young are excluded, they are particularly solicitous for their safety.

As the food of these birds consists in a great measure of frogs and serpents, it is not to be wondered at, that different nations have paid them a particular veneration. The Dutch are very solicitous for the preservation of the stork in every part of the republic. This bird seems to have taken refuge among their towns; and builds on the tops of their houses without any molestation. There it is seen resting familiarly in the streets, and protected as well by the laws as the prejudices of the people. They have even got an opinion that it will only live in a republic; and that story of its filial piety, first falsely propagated of the crane, has in part been ascribed to the stork. But it is not in republics alone that the stork is seen to reside, as there are few towns on the continent, in low marshy situations, but have the stork as an inmate among them; as well the despotic princes of Germany, as the little republics of Italy.

The stork seems a general favourite even among the moderns; but with the ancient Egyptians their regard was carried even to adoration This enlightened people, who worshipped the Deity in his creatures, paid divine honours to the Ibis, as is universally known. It has been usually supposed that the ancient Ibis is the same with that which goes at present by the same name; a bird of the stork kind, of about the size of a curlew, all over black, with a bill very thick in the beginning, but ending in a point for the better seizing its prey, which is caterpillars, locusts, and serpents. But, however useful the modern ibis may be in ridding Egypt, where it resides, of the vermin and venomous animals that infest it; yet it is much doubted whether this be the same Ibis to which the ancients paid their adoration. Maillet the French consul at Cairo, observes, that it is very hard to determine what bird the ancient Ibis certainly was, because there are cranes, storks, hawks, kites, and falcons, that are all equally enemies to serpents, and devour a vast number. He farther adds, that in the month of May, when the winds begin to blow from the internal parts of Africa, there are several sorts of birds that come down from Upper-Egypt, from whence they are driven by the rains, in search of a better habitation, and that it is then they do this country such signal services. Nor does the figure of this bird hieroglyphically represented on their pillars mark it sufficiently to make the distinction. Besides, the modern Ibis is not peculiar to Egypt, as it is to be seen but at certain seasons of the year; whereas we are informed by Pliny that this bird was seen no where else. It is thought, therefore, that the true ibis is a bird of the vulture kind, described above, and called by some the *capon of Pharaoh*, which not only is a devourer of serpents, but will follow the caravans that go to Mecca, to feed upon the offal of the animals that are killed on the journey.

CHAPTER IV.

OF THE BALEARIC AND OTHER FOREIGN CRANES.

HAVING ended the last chapter with doubts concerning the ibis, we shall begin this with doubts concerning the Balearic Crane. Pliny has described a bird of the crane kind with a topping resembling that of the green wood-pecker. This bird for a long time continued unknown, till we became acquainted with birds of tropical climates, when one of the crane kind with a topping was brought into Europe, and described by Aldrovandus as Pliny's Balearic Crane. Hence these birds, which have since been brought from Africa and the East in numbers, have received the name of Balearic Cranes, but without any just foundation. The real Balearic Crane of Pliny seems to be the lesser ash-coloured heron, with a topping of narrow white feathers, or perhaps the egret, with two long feathers that fall back from the sides of the head. The bird that we are about to describe under the name of the Balearic Crane was unknown to the ancients, and the heron or egret ought to be reinstated in their just title to that name.

When we see a very extraordinary animal, we are naturally led to suppose that there must be something also remarkable in its history to correspond with the singularity of its figure. But it often happens that history fails on those occasions where we most desire information. In the present instance, in particular, no bird presents to the eye a more whimsical figure than this, which we must be content to call the *Balearic Crane.* It is pretty nearly of the shape and size of the ordinary crane, with long legs and a long neck, like others of the kind; but the bill is shorter, and the colour of the feathers of a dark greenish grey. The head and throat form the most striking part of this bird's figure. On the head is seen standing up, a thick round crest, made of bristles, spreading every way, and resembling rays standing out in different directions. The longest of these rays are about three inches and a half, and they are all topped with a kind of black tassels, which give them a beautiful appearance. The sides of the head and cheeks are bare, whitish, and edged with red, while underneath the throat hangs a kind of bag or wattle, like that of a cock, but not divided into two. To give this odd composition a higher finishing, the eye is large and staring; the pupil black and big, surrounded with a gold-coloured iris, that completes the bird's very singular appearance

From such a peculiar figure, we might be led to wish for a minute history of its manners; but of these we can give but slight information. This bird comes from ,the coast of Africa, and the Cape de Verd Islands. As it runs, it stretches out its wings, and goes very swiftly, otherwise its usual motion is very slow. In their domestic state, they walk very deliberately among other poultry, and suffer themselves to be approached (at least it was so with that I saw) by every spectator. They never roost in houses: but about night, when they are disposed to go to rest, they search out some high wall, on which they perch in the manner of a peacock. Indeed they so much resemble that bird in manners and disposition, that some have described them by the name of the *sea-peacock:* and Ray has been inclined to rank them in the same family. But though their voice and roosting be similar, their food, which is entirely upon greens, vegetables, and barley, seems to make some difference.

In this chapter of foreign birds of the crane kind, it will be proper to mention the Jabiru and the Jabiru Guacu, both natives of Brazil. Of these great birds of the crane kind we know but little, except the general outline of their figure, and the enormous bills which we often see preserved in the cabinets of the curious. The bill of the latter is red, and thirteen inches long; the bill of the former is black, and is found to be eleven. Neither of them, however, are of a size proportioned to their immoderate length of bill. The jabiru guacu is not above the size of a common stork, while the jabiru with the smallest bill, exceeds the size of a swan. They are both covered with white feathers, except the head and neck that are naked; and their principal difference is in the size of the body, and the make of the bill; the lower chap of the jabiru guacu being broad, and bending upwards.

A bird still more extraordinary may be added to this class, called the *anhima*, and, like the two former, a native of Brazil. This is a water-fowl of the rapacious kind, and bigger than a swan. The head, which is small for the size of the body, bears a black bill, which is not above two inches long: but what distinguishes it in particular is a horn growing from the forehead as long as the bill, and bending forward like that of the fabulous unicorn of the ancients. This horn is not much thicker than a crow-quill, as round as if it were turned in a lathe, and of an ivory colour. But this is not the only instrument of battle this formidable bird carries; it seems to be armed at all points, for at the fore-part of each wing, at the second joint, spring two straight triangular spurs, about as thick as one's little finger: the foremost of these goads or spurs is above an inch long; the hinder is shorter, and both of a dusky colour The claws also are long and sharp; the colour is black and white, and they cry terribly loud, sounding something like *Vyhoo*, *Vyhoo*. They are never found alone, but always in pairs: the cock and hen prowl together, and their fidelity is said to be such, that when one dies, the other never departs from the carcass, but dies with its companion. It makes its nest of clay, near the bodies of trees upon the ground, of the shape of an oven.

One bird more may be subjoined to this class, not for the oddity of its figure, but the peculiarity of its manners. It is vulgarly called by our sailors the *buffoon-bird*, and by the French the *demoiselle or lady*. The same qualities have procured it these different appellations from two nations, who, on more occasions than this, look upon the same objects in very different lights. The peculiar gestures and contortions of this bird, the proper name of which is the *Numidian crane*, are extremely singular, and the French, who are skilled in the arts of elegant gesticulation, consider all its motions as lady-like and graceful. Our English sailors, however, who have not entered so deeply into the dancing art, think that while thus in motion, the bird cuts but a very ridiculous figure. It stoops, rises, lifts one wing, and then another, turns round, sails forward, then back again; all which highly diverts our seamen; not imagining, perhaps, that all these contortions are but the awkward expression, not of the poor animal's pleasures, but its fears.

It is a very scarce bird; the plumage is of a leaden grey; but it is distinguished by fine white feathers, consisting of long fibres, which fall from the back of the head, about four inches long, while the fore-part of the neck is adorned with black feathers, composed of very fine, soft, and long fibres, that hang down upon the stomach, and give the bird a very graceful appearance. The ancients have described a buffoon bird, but there are many reasons to believe that theirs is not the Numidian crane. It comes from that country from whence it has taken its name.

CHAPTER V.

OF THE HERON AND ITS VARIETIES.

BIRDS of the Crane, the Stork, and the Heron kind bear a very strong affinity to each other, and their differences are not easily discernible. As for the crane and the stork, they differ rather in their nature and internal conformation than in their external figure, but still they may be known asunder, as well by their colour as by the stork's claws, which are very peculiar, and more resembling a man's nails than the claws of a bird. The heron may be distinguished from both, as well by its size, which is much less, as by its bill, which in proportion is much longer; but particularly by the middle claw on each foot, which is toothed like a saw, for the better seizing and holding its slippery prey. Should other marks fail, however, there is an anatomical distinction, in which herons differ from all other birds; which is, that they have but one cæcum, and all other birds have two

Of this tribe Brisson has enumerated not less than forty-seven sorts, all differing in their size, figure, and plumage, and with talents adapted to their place of residence, or their peculiar pursuits. But, how various soever the heron kind may be in their colours or their

Plover, (Long-legged), p. 184.

Eared Grebe, p. 188.

Coot, p. 187.

Ruff, p. 186.

Oyster-catcher, p. 182.

Woodcock, p. 182.

To face p. 170, vol. iii.

bills, they all seem possessed of the same manners, and have but one character of cowardice, rapacity and indolence, yet insatiable hunger. Other birds are found to grow fat by an abundant supply of food; but these, though excessively destructive and voracious, are ever found to have lean and carrion bodies, as if not even plenty were sufficient for their support.

The common heron is remarkably light, in proportion to its bulk, scarce weighing three pounds and a half, yet it expands a breadth of wing which is five feet from tip to tip. Its bill is very long, being five inches from the point to the base; its claws are long, sharp, and the middlemost toothed like a saw. Yet thus armed as it appears for war, it is indolent and cowardly, and even flies at the approach of a sparrow-hawk. It was once the amusement of the great to pursue this timorous creature with the falcon; and heron-hawking was so favourite a diversion among our ancestors, that laws were enacted for the preservation of the species, and the person who destroyed their eggs was liable to a penalty of twenty shillings for each offence.

At present, however, the defects of the ill-judged policy of our ancestors is felt by their posterity; for as the amusement of hawking has given place to the more useful method of stocking fish ponds, the heron is now become a most formidable enemy. Of all other birds, this commits the greatest devastation in fresh-waters, and there is scarce a fish, though never so large, that he will not strike at and wound, though unable to carry it away. But the smaller fry are his chief subsistence; these, pursued by their larger fellows of the deep, are obliged to take refuge in shallow waters, where they find the heron a still more formidable enemy. His method is to wade as far as he can go into the water, and there patiently wait the approach of his prey, which when it comes within sight, he darts upon it with inevitable aim. In this manner he is found to destroy more in a week than an otter in three months. "I have seen a heron," says Willoughby, "that had been shot, that had seventeen carps in his belly at once, which he will digest in six or seven hours, and then to fishing again. I have seen a carp," continues he, "taken out of a heron's belly nine inches and a half long. Several gentlemen who kept tame herons, to try what quantity one of them would eat in a day, have put several smaller roach and dace in a tub, and they have found him eat fifty in a day, one day with another. In this manner a single heron will destroy fifteen thousand carp in half a year."

So great are the digestive powers of this fresh-water tyrant, and so detrimental to those who stock ponds with fish. In general, he is seen taking his gloomy stand by the lake's side, as if meditating mischief, motionless and gorged with plunder. His usual attitude on this occasion is to sink his long neck between his shoulders, and keep his head turned on one side, as if eyeing the pool more intently. When the call of hunger returns, the toil of an hour or two is generally sufficient to fill his capacious stomach, and he retires long before night to his retreat in the woods. Early in the morning, however, he is seen assiduous at his usual occupation.

But, though in seasons of fine weather the heron can always find a plentiful supply, in cold or stormy seasons, his prey is no longer within reach: the fish that before came into the shallow water, now keep in the deep, as they find it to be the warmest situation. Frogs and lizards also seldom venture from their lurking places, and the heron is obliged to support himself upon his long habits of patience, and even to take up with the weeds that grow upon the water. At those times he contracts a consumptive disposition, which succeeding plenty is not able to remove; so that the meagre glutton spends his time between want and riot, and feels alternately the extremes of famine and excess. Hence, notwithstanding the care with which he takes his prey, and the amazing quantity he devours, the heron is always lean and emaciated; and though his crop be usually found full, yet his flesh is scarce sufficient to cover the bones.

The heron usually takes his prey by wading into the water, yet it must not be supposed that he does not also take it upon the wing. In fact, much of his fishing is performed in this manner; but he never hovers over deep waters, as there his prey is enabled to escape him by sinking to the bottom. In shallow places he darts with more certainty; for though the fish at sight of its enemy instantly descends, yet the heron, with his long bill and legs, instantly pins it to the bottom, and thus seizes it securely. In this manner, after having been seen with his long neck for above a minute under water, he rises upon the wing, with a trout or an eel struggling in his bill to get free. The greedy bird, however, flies to the shore, scarce gives it time to expire, but swallows it whole, and then returns to fishing as before.

As this bird does incredible mischief to ponds newly stocked, Willoughby has given a receipt for taking them. "Having found his haunt, get three or four small roach or dace, and having provided a strong hook with a wire to it, this is drawn just withinside the skin of the fish, beginning withoutside the gills, and running it to the tail, by which the fish will not be killed, but continue for five or six days alive. Then having a strong line made of silk and wire, about two yards and a half long, it is tied to a stone at one end, the fish with the hook being suffered to swim about at the other. This being properly disposed in shallow water, the heron will seize upon the fish to its own destruction. From this method we may learn, that the fish must be alive, otherwise the heron will not touch them, and that the bird, as well as all those that feed upon fish, must be its own caterer; for they will not prey upon such as die naturally, or are killed by others before them."

Though this bird lives chiefly among pools and marshes, yet its nest is built on the tops of the highest trees, and sometimes on cliffs hanging over the sea. They are never in flocks when they fish, committing their depredations in solitude and silence; but in making their nests they love each other's society, and they are seen, like rooks, building in company with flocks of their kind. Their nests are made of sticks, and lined with wool, and the female lays four large eggs of a pale green colour. The observable indolence of their nature, however, is not less seen in their nestling than in their habits of depredation. Nothing is more certain, and I have seen it a hundred times, than that they will not be at the trouble of building a nest when they can get one made by the rook, or deserted by the owl, already provided for them. This they usually enlarge and line within, driving off the original possessors, should they happen to renew their fruitless claims.

The French seem to have availed themselves of the indolence of this bird in making its nest, and they actually provide a place with materials fitted for their nestling, which they call *heronries*. The heron, which with us is totally unfit for the table, is more sought for in France, where the flesh of the young ones is in particular estimation. To obtain this, the natives raise up high sheds along some fishy stream, and furnishing them with materials for the herons to nestle with, these birds build and breed there in great abundance. As soon as the young ones are supposed to be fit, the owner of the heronry comes, as we do into a pigeon-house, and carries off such as are proper for eating, and these are sold for a very good price to the neighbouring gentry. " These are a delicacy which," as my author says, " the French are very fond of, but which strangers have not yet been taught to relish as they ought." Nevertheless it was formerly much esteemed as food in England, and made a favourite dish at great tables. It was then said that the flesh of a heron was a dish for a king; at present nothing about the house will touch it but a cat.

With us, therefore, as the heron, both old and young, is thought detestable eating, we seldom trouble these animals in their heights, which are for the most part sufficiently inaccessible. Their nests are often found in great numbers in the middle of large forests, and in some groves nearer home, where the owners have a predilection for the bird, and do not choose to drive it from its accustomed habitations. It is certain that by their cries, their expansive wings, their bulk and wavy motion, they add no small solemnity to the forest, and give a pleasing variety to a finished improvement.

When the young are excluded, as they are numerous, voracious, and importunate, the old ones are for ever upon the wing to provide them with abundance. The quantity of fish they take upon this occasion is amazing, and their size is not less to be wondered at. I remember a heron's nest that was built near a school-house; the boys, with their usual appetite for mischief, climbed up, took down the young ones, sewed up their vents, and laid them in the nest as before. The pain the poor little animals felt from the operation increased their cries, and this but served to increase the diligence of the old ones in enlarging their supply. Thus they heaped the nest with various sorts of fish, and the best of their kind, and as their young screamed they flew off for more. The boys gathered up the fish, which the young ones were incapable of eating, till the old ones at last quitted their nest, and gave up their brood, whose appetites they found it impossible to satisfy.

The heron is said to be a very long-lived bird; by Mr. Keysler's account, it may exceed sixty years; and by a recent instance of one that was taken in Holland, by a hawk belonging to the Stadtholder its longevity is again confirmed, the bird having a silver plate fastened to one leg, with an inscription, importing that it had been struck by the elector of Cologne's hawks thirty-five years before

CHAPTER IV.

OF THE BITTERN, OR MIRE-DRUM

THOSE who have walked in an evening by the sedgy sides of unfrequented rivers, must remember a variety of notes from different water-fowl: the loud scream of the wild-goose, the croaking of the mallard, the whining of the lapwing, and the tremulous neighing of the jacksnipe. But of all these sounds there is none so dismally hollow as the booming of the bittern. It is impossible for words to give those who have not heard this evening call an adequate idea of its solemnity. It is like the uninterrupted bellowing of a bull, but hollower and louder, and is heard at a mile's distance, as if issuing from some formidable being that resided at the bottom of the waters.

The bird, however, that produces this terrifying sound, is not so big as a heron, with a weaker bill, and not above four inches long. It differs from the heron chiefly in its colour, which is in general a palish yellow, spotted and barred with black. Its wind-pipe is fitted to produce the sound for which it is remarkable; the lower part of it dividing into the lungs is supplied with a thin loose membrane that can be filled with a large body of air, and exploded at pleasure These bellowing explosions are chiefly heard from the beginning of spring to the end of autumn; and, however awful they may seem to us, are the calls to courtship, or of connubial felicity.

From the loudness and solemnity of the note, many have been led to suppose that the bird made use of external instruments to produce it, and that so small a body could never eject such a quantity of tone. The common people are of opinion that it thrusts its bill into a reed that serves as a pipe for swelling the note above its natural pitch; while others, and in this number we find Thomson, the poet, imagine that the bittern puts its head under water, and then violently blowing produces its boomings. The fact is, that the bird is sufficiently provided by Nature for this call, and it is often heard where there are neither reeds nor waters to assist its sonorous invitations.

It hides in the sedges by day, and begins its call in the evening, booming six or eight times, and then discontinuing for ten or twenty minutes to renew the same sound. This is a call it never gives but when undisturbed and at liberty. When its retreats among the sedges are invaded, when it dreads or expects the approach of an enemy, it is then perfectly silent. This call it has never been heard to utter when taken or brought up in domestic captivity; it continues, under the control of man, a mute forlorn bird, equally incapable of attachment or instruction. But though its boomings are always performed in solitude, it has a scream which is generally heard upon the seizing its prey, and which is sometimes extorted by fear.

This bird, though of the heron kind, is yet neither so destructive, nor so voracious. It is a retired timorous animal, concealing itself in the midst of reeds and marshy places, and living upon frogs, insects, and vegetables; and though so nearly resembling the heron in figure, yet differing much in manners and appetites. As the heron builds on the tops of the highest trees, the bittern lays its nest in a sedgy margin, or amidst a tuft of rushes. The heron builds with sticks and wool; the bittern composes its simpler habitation of sedges, the leaves of water-plants, and dry rushes. The heron lays four eggs; the bittern generally seven or eight, of an ash-green colour The heron feeds its young for many days; the bittern in three days leads its little ones to their food. In short the heron is lean and cadaverous, subsisting chiefly upon animal food; the bittern is plump and fleshy, as it feeds upon vegetables, when more nourishing food is wanting.

It cannot be, therefore, from its voracious appetites, but its hollow boom, that the bittern is held in such detestation by the vulgar. I remember in the place where I was a boy with what terror this bird's note affected the whole village; they considered it as the presage of some sad event; and generally found or made one to succeed it. I do not speak ludicrously; but if any person in the neighbourhood died, they supposed it could not be otherwise, for the night-raven had foretold it: but if nobody happened to die, the death of a cow or a sheep gave completion to the prophecy.

Whatever terror it may inspire among the simple, its flesh is greatly in esteem among the luxurious. For this reason it is as eagerly sought after by the fowler, as it is shunned by the peasant; and, as it is a heavy-rising, slow-winged bird, it does not often escape him. Indeed, it seldom rises but when almost trod upon, and seems to seek protection rather from concealment than flight. At the latter end of autumn, however, in the evening, its wonted indolence appears to forsake it. It is then seen rising in a spiral ascent, till it is quite lost from the view, making at the same time a singular noise very different from its former boomings. Thus the same animal is often seen to assume different desires; and while the Latins have given the bittern the name of the star-reaching bird (or the *stellaris*,) the Greeks, taking its character from its more constant habits, have given it the title of the *oknos*, or the lazy.

CHAPTER VII.

OF THE SPOONBILL, OR SHOVELLER.

AS we proceed in our description of the crane kind, birds of peculiar forms offer, not entirely like the crane, and yet not so different as to rank more properly with any other class. Where the long neck and stilt-like legs of the crane are found, they make too striking a resemblance, not to admit such birds of the number; and though the bill, or even the toes should entirely differ, yet the outlines of the figure, and the natural habits and dispositions being the same, these are sufficient to mark their place in the general group of Nature.

The spoonbill is one of those birds which differs a good deal from the crane, yet approaches this class more than any other. The body is more bulky from its height, and the bill is very differently formed from that of any bird whatever. Yet still it is a comparatively tall bird: it feeds among waters; its toes are divided; and it seems to possess the natural dispositions of the crane. The European spoon bill is of about the bulk of a crane; but as the one is above four fee high, the other is not more than three feet three inches. The com mon colour of those of Europe is a dirty white; but those of Ameri ca are of a beautiful rose colour, or a delightful crimson. Beauty ot plumage seems to be the prerogative of all the birds of that continent, and we here see the most splendid tints bestowed on a bird whose figure is sufficient to destroy the effects of its colouring; for its bill is so oddly fashioned, and its eyes so stupidly staring, that its fine feathers only tend to add splendour to deformity. The bill, which in this bird is so very particular, is about seven inches long, and running out broad at the end, as its name justly serves to denote, it is there about an inch and a half wide. This strangely fashioned instrument in some is black; in others of a light grey, and in those of America, it is of a red colour, like the rest of the body. All round the upper chap there runs a kind of rim, with which it covers that beneath; and as for the rest, its cheeks and its throat aro without feathers, and covered with a black skin.

A bird so oddly fashioned, might be expected to possess some very peculiar appetites; but the spoonbill seems to lead a life entirely resembling all those of the crane kind; and Nature, when she made the bill of this bird so very broad, seems rather to have sported with its form, than to aim at any final cause for which to adapt it. In fact, it is but a poor philosophy to ascribe every capricious variety in Nature to some salutary purpose: in such solutions we only impose upon each other, and often wilfully contradict our own belief. There must be imperfections in every being, as well as capacities of enjoyment. Between both, the animal leads a life of moderate felicity; in part making use of its many natural advantages, and in part necessarily conforming to the imperfection of its figure.

The shoveler chiefly feeds upon frogs, toads, and serpents, of which, particularly at the Cape of Good Hope, they destroy great numbers. The inhabitants of that country hold them in as much esteem as the ancient Egyptians did their bird Ibis: the shoveler runs tamely about their houses; and they are content with its society, as a useful, though a homely companion. They are never killed; and indeed they are good for nothing when they are dead, for the flesh is unfit to be eaten.

This bird breeds in Europe, in company with the heron, in high trees; and in a nest formed of the same materials. Willoughby tells us, that in a certain grove, at a village called Seven Huys, near Leyden, they build and breed yearly in great numbers. In this grove,

Avoset, p. 181.

Common Tern, p. 190.

Kingfisher, p. 226.

Hooded Merganser, or Goosander, p. [illegible]

Guinea, or Swan Goose, p. 212.

Great Auk, p 210.

To face p. 177 vol. iii.

also, the heron, the bittern, the cormorant, and the shag, have taken up their residence, and annually bring forth their young together. Here the crane kind seems to have formed their general rendezvous; and as the inhabitants say, every sort of bird has its several quarter, where none but their own tribe are permitted to reside. Of this grove the peasants of the country make good profit. When the young ones are ripe, those that farm the grove, with a hook at the end of a long pole, catch hold of the bough on which the nest is built, and shake out the young ones; but sometimes the nest and all tumble down together.

The shoveler lays from three to five eggs, white and powdered with a few sanguine or pale spots. We sometimes see in the cabinets of the curious, the bills of American shovelers, twice as big and as long as those of the common kind among us; but these birds have not yet made their way into Europe.

CHAPTER VIII.

THE FLAMINGO

THE Flamingo has the justest right to be placed among cranes; and though it happens to be web-footed, like birds of the goose kind, yet its height, figure, and appetites entirely remove it from that grovelling class of animals. With a longer neck and legs than any other of the crane kind, it seeks its food by wading among waters, and only differs from all of this tribe in the manner of seizing its prey; for as the heron makes use of its claws, the flamingo uses only its bill, which is strong and thick for the purpose, the claws being useless, as they are feeble, and webbed like those of water-fowl.

The flamingo is the most remarkable of all the crane kind, the tallest, bulkiest, and the most beautiful. The body, which is of a beautiful scarlet, is no bigger than that of a swan; but its legs and neck are of such an extraordinary length, that when it stands erect, it is six feet six inches high. Its wings, extended, are five feet six inches from tip to tip; and it is four feet eight inches from tip to tail The head is round and small, with a large bill, seven inches long partly red, partly black, and crooked like a bow. The legs and thighs, which are not much thicker than a man's finger, are about two feet eight inches high, and its neck near three feet long. The feet are not furnished with sharp claws, as in others of the crane kind, but feeble, and united by membranes, as in those of the goose. Of what use these membranes are does not appear, as the bird is never seen swimming, its legs and thighs being sufficient for bearing it into those depths where it seeks for prey.

This extraordinary bird is now chiefly found in America, but it was once known on all the coasts of Europe Its beauty, its size and the peculiar delicacy of its flesh, have been such temptations to destroy or take it, that it has long since deserted the shores frequented by man, and taken refuge in countries that are as yet but thinly peopled. In those desert regions the flamingos live in a state of society, and under a better polity than any other of the feathered creation.

When the Europeans first came to America, and coasted down along the African shores, they found the flamingos on several shores, on either continent, gentle, and noway distrustful of mankind.* They had long been used to security, in the extensive solitudes they had chosen, and knew no enemies but those they could very well evade or oppose. The Negroes and the native Americans were possessed but of few destructive arts for killing them at a distance, and when the bird perceived the arrow, it well knew how to avoid it. But it was otherwise when the Europeans first came among them: the sailors, not considering that the dread of firearms was totally unknown in that part of the world, gave the flamingo the character of a foolish bird, that suffered itself to be approached and shot at. When the fowler had killed one, the rest of the flock, far from attempting to fly, only regarded the fall of their companion in a kind of fixed astonishment: another and another shot was discharged, and thus the fowler often levelled the whole flock before one of them began to think of escaping.

But at present it is very different in that part of the world, and the flamingo is not only one of the scarcest, but of the shyest birds in the world, and the most difficult of approach. They chiefly keep near the most deserted and inhospitable shores, near salt-water lakes and swampy islands. They come down to the banks of rivers by day, and often retire to the inland, mountainous parts of the country at the approach of night. When seen by mariners in the day, they always appear drawn up in a long, close line of two or three hundred together; and, as Dampier tells us, present, at the distance of half a mile, the exact representation of a long brick wall. Their rank, however, is broken when they seek for food; but they always appoint one of their number as a watch, whose only employment is to observe and give notice of danger, while the rest are feeding. As soon as this trusty sentinel perceives the remotest appearance of danger, he gives a loud scream, and with a voice as shrill as a trumpet, and instantly the whole cohort are upon the wing. They feed in silence, but upon this occasion all the flock are in one chorus, and fill the air with intolerable screamings.

From this it appears that the flamingos are very difficult to be approached at present, and that they avoid mankind with the most cautious timidity; however, it is not from any antipathy to man that they shun his society, for in some villages, as we are assured by Labat, along the coasts of Africa, the flamingos come in great numbers to make their residence among the natives. There they assemble by thousands, perched on the trees, within and about the village, and are so very clamorous, that the sound is heard at near a mile's distance. The Negroes are fond of their company, and consider their society as a gift of Heaven, as a protection from accidental evils. The French, who are admitted to this part of the coast, cannot, without some degree of discontent, see such a quantity of game untouched, and rendered useless by the superstition of the natives: they now and then privately shoot some of them when at a convenient distance from the village, and hide them in the long grass, if they perceive any of the Negroes approaching; for they would probably stand a chance of being ill treated, if the blacks discovered their sacred birds thus unmercifully treated.

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* Albin's New History of Birds.

Sometimes, in their wild state, they are shot by mariners; and their young, which run excessively fast, are often taken. Labat has frequently taken them with nets, properly extended round the places they breed in. When their long legs are entangled in the meshes, they are then unqualified to make their escape: but they still continue to combat with their destroyer; and the old ones, though seized by the head, will scratch with their claws, and these, though seemingly inoffensive, very often do mischief. When they are fairly disengaged from the net, they nevertheless preserve their natural ferocity; they refuse all nourishment; they peck and combat with their claws at every opportunity. The fowler is, therefore, under the necessity of destroying them, when taken; as they would only pine and die, if left to themselves in captivity. The flesh of the old ones is black and hard; though, Dampier says, well tasted: that of the young ones is still better. But, of all other delicacies, the flamingo's tongue is the most celebrated. "A dish of flamingos' tongues," says our author, "is a feast for an emperor." In fact, the Roman emperors considered them as the highest luxury; and we have an account of one of them, who procured fifteen hundred flamingos' tongues to be served up in a single dish. The tongue of this bird, which is so much sought after, is a good deal larger than that of any other bird whatever. The bill of the flamingo is like a large black box, of an irregular figure, and filled with a tongue which is black and gristly; but what peculiar flavour it may possess, I leave to be determined by such as understand good eating better than I do. It is probable that the beauty and scarcity of the bird might be the first inducements to studious gluttony to fix upon its tongue as meat for the table. What Dampier says of the goodness of its flesh, cannot so well be relied on; for Dampier was often hungry, and thought any thing good that could be eaten: he avers, indeed, with Labat, that the flesh is black, tough, and fishy; so that we can hardly give him credit, when he asserts, that its flesh can be formed into a luxurious entertainment.

These birds, as was said, always go in flocks together; and they move in ranks, in the manner of cranes. They are sometimes seen, at the break of day, flying down in great numbers from the mountains, and conducting each other with a trumpet cry, that sounds like the word *Tococo*, from whence the savages of Canada have given them the name. In their flight they appear to great advantage; for they then seem of as bright a red as a burning coal. When they dispose themselves to feed, their cry ceases; and then they disperse over a whole marsh, in silence and assiduity, Their manner of feeding is very singular: the bird thrusts down its head, so that the upper convex side of the bill shall only touch the ground; and in this position the animal appears, as it were, standing upon its head. In this manner it paddles and moves the bill about, and seizes whatever fish or insect happens to offer. For this purpose the upper chap is notched at the edges, so as to hold its prey with greater security. Catesby, however, gives a different account of their feeding. According to him, they thus place the upper chap undermost, and so work about, in order to pick up a seed from the bottom of the water, that resembles millet: but as in picking up this, they necessarily also suck in a greater quantity of mud, their bill is toothed at the edges in such a manner as to let out the mud while they swallow the grain.

Their time of breeding is according to the climate in which they reside: in North America they breed in our summer; on the other side the line they take the most favourable season of the year. They build their nests in extensive marshes, and where they are in no danger of a surprise. The nest is not less curious than the animal that builds it. It is raised from the surface of the pool about a foot and a half, formed of mud scraped up together, and hardened by the sun, or the heat of the bird's body; it resembles a truncated cone, or one of the pots which we see placed on chimneys; on the top it is hollowed out to the shape of the bird, and in that cavity the female lays her eggs, without any lining but the well-cemented mud that forms the sides of the building. She always lays two eggs, and no more; and, as her legs are immoderately long, she straddles on the nest, while her legs hang down, one on each side, into the water.

The young ones are a long while before they are able to fly; but they run with amazing swiftness. They are sometimes caught, and very different from the old ones, suffer themselves to be carried home, and are tamed very easily. In five or six days they become familiar, eat out of the hand, and drink a surprising quantity of sea-water. But though they are easily rendered domestic, they are not reared without the greatest difficulty: for they generally pine away for want of their natural supplies, and die in a short time. While they are yet young, their colours are very different from those lively tints they acquire with age. In their first year they are covered with a plumage of a white colour, mixed with gray; in the second year the whole body is white, with here and there a slight tint of scarlet; and the great covert feathers of the wings are black: the third year the bird acquires all its beauty; the plumage of the whole body is scarlet, except some of the feathers in the wings, that still retain their sable hue. Of these beautiful plumes the savages make various ornaments, and the bird is sometimes skinned by the Europeans to make muffs. But these have diminished in their price, since we have obtained the art of dying feathers of the brightest scarlet

CHAPTER IX.

OF THE AVOSETTA, OR SCROOPER; AND THE CORRIRA, OR RUNNER.

THE extraordinary shape of the Avosetta's bill might incline us to wish for its history; and yet in that we are not able to indulge the reader Natural historians have hitherto, like ambitious monarchs, shown a greater fondness for extending their dominions, than cultivating what they possess. While they have been labouring to add new varieties to their catalogues, they have neglected to study the history of animals already known.

The avosetta is chiefly found in Italy, and now and then comes over into England. It is about the size of a pigeon, is a pretty upright bird, and has extremely long legs for its size. But the most extraordinary part of its figure, and that by which it may be distinguished from all others of the feathered tribe, is the bill, which turns up like a hook, in an opposite direction to that of the hawk or the parrot. This extraordinary bill is black, flat, sharp, and flexible at the end, and about three inches and a half long. From its being bare a long way above the knee, it appears that it lives and wades in the waters. It has a chirping, pert note, as we are told, but with its other habits we are entirely unacquainted. I have placed it, from its slender figure, among the cranes; although it is web-footed, like the duck It is one of those birds of whose history we are yet in expectation.

To this bird of the crane kind, so little known, I will add another, still less known; the Corrira, or Runner, of Aldrovandus. All we are told of it is, that it has the longest legs of all the web-footed fowls, except the flamingo and avosetta; that the bill is straight, yellow and black at the ends; that the pupils of the eyes are surrounded with two circles, one of which is bay, and the other white: below, near the belly, it is whitish; the tail, with two white feathers, black at the extremities; and that the upper part of the body is of the colour of rusty iron. It is thus that we are obliged to substitute dry description for instructive history, and employ words, to express those shadings of colour which the pencil alone can convey.

CHAPTER X.

OF SMALL BIRDS OF THE CRANE KIND, WITH THE THIGHS PARTLY BARE OF FEATHERS.

AS I have taken my distinctions rather from the general form and manners of birds, than from their minuter, though perhaps more precise, discriminations, it will not be expected that I should here enter into a particular history of a numerous tribe of birds, whose manners and forms are so very much alike. Of many of them we have scarce any account in our historians, but tedious descriptions of their dimensions, and the colour of their plumage; and of the rest the history of one is so much that of all, that it is but the same account repeated to a most disgusting reiteration. I will therefore groupe them into one general draught, in which the more eminent, or the most whimsical, will naturally stand forward on the canvass.

In this group we find an extensive tribe of native birds, with their varieties and affinities; and we might add a hundred others of distant climates, of which we know little more than the colour and the name. In this list is exhibited the Curlew, a bird of about the size of a duck, with a bill four inches long: the Woodcock, about the size of a pigeon, with a bill three inches long: the Godwit of the same size; the bill four inches: the Green Shank, longer legged; the bill two inches and a half: the Red Shank, differing in the colour of its feet from the former: the Snipe, less by half, with a bill three inches. Then with shorter bills—the Ruff, with a collar of feathers round the neck of the male: the Knot, the Sandpiper, the Sanderling, the Dunlin, the Purre, and the Stint. To conclude: with bills very short—The Lapwing, the Green Plover, the Gray Plover, the Dottrel, the Turnstone, and the Sea-lark. These, with their affinities, are properly natives or visitants of this country, and are dispersed along our shores, rivers, and watery grounds. Taking in the birds of this kind, belonging to other countries, the list would be very widely extended, and the whole of this class, as described by Brisson, would amount to near a hundred.

All these birds posesses many marks in common, though some have peculiarities that deserve regard. All these birds are bare of feathers above the knee, or above the heel, as some naturalists choose to express it. In fact, that part which I call the knee, if compared with the legs of mankind, is analogous to the heel: but as it is commonly conceived otherwise, I have conformed to the general apprehension I say, therefore, that all these birds are bare of feathers above the knee, and in some they are wanting half way up the thigh. The nudity in that part is partly natural, and partly produced by all birds of this kind habitually wading in water. The older the bird, the barer are its thighs; yet even the young ones have not the same downy covering, reaching so low as the birds of any other class. Such a covering there would rather be prejudicial, as being continually liable to get wet in the water.

As these birds are usually employed rather in running than in flying, and as their food lies entirely upon the ground, and not on trees, or in the air, so they run with great swiftness for their size, and the length of their legs assist their velocity. But as in seeking their food, they are often obliged to change their station; so also are they equally swift of wing, and traverse immense tracts of country without much fatigue.

It has been thought by some, that a part of this class lived upon an oily slime, found in the bottoms of ditches and of weedy pools; they were thence termed by Willoughby, *Mudsuckers*. But later discoveries have shown that in these places, they hunt for the caterpillars and worms of insects. From hence, therefore, we may generally assert, that all birds of this class live upon animals of one kind or another. The long-billed birds suck up worms and insects from the bottom; those furnished with shorter bills, pick up such insects as lie nearer the surface of the meadow, or among the sands on the sea-shore.

Thus the curlew, the woodcock, and the snipe, are ever seen in plashy brakes, and under covered hedges, assiduously employed in seeking out insects in their worm state; and it seems, from their fatness, that they find a plentiful supply. Nature, indeed, has furnished them with very convenient instruments for procuring their food. Their bills are made sufficiently long for searching; but still more, they are endowed with an exquisite sensibility at the point, for feeling their provision. They are furnished with no less than three pair of nerves, equal almost to the optic nerves in thickness, which pass from the roof of the mouth, and run along the upper chap to the point.

Nor are those birds with shorter bills, and destitute of such convenient instruments, without a proper provision made for their subsistence. The lapwing, the sandpiper, and the redshank run with surprising rapidity along the surface of the marsh, or the sea-shore, quarter their ground with great dexterity, and leave nothing of the insect kind that happens to lie on the surface. These, however, are neither so fat nor so delicate as the former, as they are obliged to toil more for a subsistence; they are easily satisfied with whatever offers, and their flesh often contracts a relish from what has been their latest, or their principal food.

Most of the birds formerly described, have stated seasons for feeding and rest: the eagle kind prowl by day, and at evening repose; the owl by night, and keeps unseen in the day-time; but these birds, of the crane kind, seem at all hours employed; they are seldom at rest by day; and during the whole night season, every meadow and marsh resounds with their different calls, to courtship or to food.

This seems to be the time when they least fear interruption from man; and though they fly at all times, yet at this season they appear more assiduously employed, both in providing for their present support, and continuing that of posterity. This is usually the season when the insidious fowler steals in upon their occupations, and fills the whole meadow with terror and destraction.

As all of this kind live entirely in waters, and among watery places, they seem provided by Nature with a warmth of constitution to fit them for that cold element. They reside, by choice, in the coldest climates: and as other birds migrate here in our summer, their migrations nither are mostly in the winter. Even those that reside among us the whole season, retire in summer to the tops of our bleakest mountains, where they breed, and bring down their young, when the cold weather sets in.

Most of them, however, migrate, and retire to the polar regions, as those that remain behind in the mountains, and keep with us during summer, bear no proportion to the quantity which in winter haunt our marshes and low grounds. The snipe sometimes builds here, and the nest of the curlew is sometimes found in the plashes of our hills: but the number of these is very small, and it is most probable that they are only some stragglers who, not having strength or courage sufficient for the general voyage, take up from necessity their habitation here.

In general, during the summer, this whole class either choose the coldest countries to retire to, or the coldest and the moistest part of ours to breed in. The curlew, the woodcock, the snipe, the godwit, the gray plover, the green, and the long-legged plover, the knot and he turnstone are rather the guests than the natives of this island. They visit us in the beginning of winter, and forsake us in the spring They then retire to the mountains of Sweden, Poland, Prussia, and Lapland, to breed. Our country, during the summer season, becomes uninhabitable to them. The ground parched up by the heat the springs dried away, and the vermicular insects already upon the wing, they have no means of subsisting. Their weak and delicately pointed bills are unfit to dig into a resisting soil, and their prey is departed, though they were able to reach its retreats. Thus that season when Nature is said to teem with life, and to put on her gayest liveries, is to them an interval of sterility and famine. The coldest mountains of the north are then a preferable habitation; the marshes there are never dried up, and the insects are in such abundance that both above ground and underneath, the country swarms with them. In such retreats, therefore, these birds would continue always, but that the frosts, when they set in, have the same effect upon the face of the landscape, as the heats of summer. Every brook is stiffened into ice; all the earth is congealed into one solid mass, and the birds are obliged to forsake a region where they can no longer find subsistence.

Such are our visitants. With regard to those which keep with us continually, and breed here, they are neither so delicate in their food, nor perhaps so warm in their constitutions. The lapwing, the ruff, the redshank, the sandpiper, the sea-pie, the Norfolk plover, and the sea-lark, breed in this country, and for the most part reside here. In summer they frequent such marshes as are not dried up in any part of the year; the Essex hundreds, and the fens of Lincolnshire. There, in solitudes formed by surrounding marshes, they breed and bring up their young In winter they come down from their retreats, rendered uninhabitable by the flooding of the waters; and seek their food about our ditches and marshy meadow-grounds. Yet even of this class, all are wanderers upon some occasions; and take wing to the northern climates to breed and find subsistence. This happens when our summers are peculiarly dry; and when the fenny countries are not sufficiently watered to defend their retreats.

But though this be the usual course of Nature, with respect to these birds, they often break through the general habits of their kind; and as the lapwing, the ruff, and the sandpiper are sometimes seen to alter their manners, and to migrate from hence, instead of continuing to breed here; so we often find the woodcock, the snipe, and the curlew, reside with us during the whole season, and breed their young in different parts of the country. In Casewood, about two miles from Tunbridge, as Mr. Pennant assures us, some woodcocks are seen to breed annually. The young have been shot there in the beginning of August; and were as healthy and vigorous as they are with us in winter, though not so well tasted. On the Alps, and other high mountains, says Willoughby, the woodcock continues all summer; I myself have flushed them on the top of Mount Jura, in June and July. The eggs are long, of a pale red colour, and stained with deeper spots and clouds. The nests of the curlew and the snipe are frequently found; and some of these perhaps never entirely leave this island.

It is thus that the same habits are, in some measure, common to all; but in nestling, and bringing up their young, one method takes place universally. As they all run and feed upon the ground, so they are all found to nestle there. The number of eggs generally to be seen in every nest, is from two to four; never under, and very seldom exceeding. The nest is made without any art; but the eggs are either laid in some little depression of the earth, or on a few bents and long grass, that scarcely preserve them from the moisture below. Yet such is the heat of the body of these birds, that their time of incubation is shorter than with any others of the same size. The magpie, for instance, takes twenty-one days to hatch its young; the lapwing takes but fourteen. Whether the animal oil, with which these birds abound. gives them their superior warmth, I cannot tell; but there is no doubt of their quick incubation.

In their season of courtship, they pair as other birds; but not without violent contests between the males, for the choice of the female. The lapwing and the plover are often seen to fight among themselves; but there is one little bird of this tribe, called the *ruff*, that has got the epithet of the *fighter*, merely from its great perseverance and animosity on these occasions. In the beginning of spring, when these birds arrive among our marshes, they are observed to engage with desperate fury against each other; it is then that the fowlers, seeing them intent on mutual destruction, spread their nets over them, and take them in great numbers. Yet even in captivity their animosity still continues: the people that fat them up for sale, are obliged to shut them up in close dark rooms; for if they let ever so little light in among them, the turbulent prisoners instantly fall to fighting with each other, and never cease till each has killed its antagonist, especially, says Willoughby, if any body stands by. A similar animosity, though in a less degree, prompts all this tribe; but when they have paired, and begun to lay, their contentions are then over.

The place these birds chiefly choose to breed in, is in some island surrounded with sedgy moors, where men seldom resort; and in such situations I have often seen the ground so strewed with eggs and nests, that one could scarce take a step, without treading upon some of them. As soon as a stranger intrudes upon these retreats, the whole colony is up, and a hundred different screams are heard from every quarter. The arts of the lapwing, to allure men or dogs from her nest, are perfectly amusing. When she perceives the enemy approaching, she never waits till they arrive at her nest, but boldly runs to meet them. When she has come as near them as she dares to venture, she then rises with a loud screaming before them, seeming as if she was just flushed from hatching; while she is then probably a hundred yards from the nest. Thus she flies, with great clamour and anxiety, whining and screaming round the invaders, striking at them with her wings, and fluttering as if she were wounded. To add to the deceit, she appears still more clamorous, as more remote from the nest. If she sees them very near, she then seems to be quite unconcerned, and her cries cease, while her terrors are really augmented. If there be dogs, she flies heavily at a little distance before them, as if maimed; still vociferous and still bold, but never offering to move towards the quarter where her treasure is deposited. The dog pursues, in hopes every moment of seizing the parent, and by this means actually loses the young; for the cunning bird, when she has thus drawn him off to a proper distance, then puts forth her powers, and leaves her astonished pursuer to gaze at the rapidity of her flight The eggs of all these birds are highly valued by the luxurious; they are boiled hard, and thus served up without any further preparation.

As the young of this class are soon hatched, so, when excluded, they quickly arrive at maturity. They run about after the mother as soon as they leave the egg; and being covered with a thick down, want very little of that clutching which all birds of the poultry kind, that follow the mother, indispensably require. They come to their adult state long before winter; and then flock together till the breeding season returns, which for a while dissolves their society.

As the flesh of almost all these birds is in high estimation, so man methods have been contrived for taking them. That used in taking the ruff, seems to be most advantageous; and it may not be amiss to describe it. The Ruff, which is the name of the male, the Reeve that of the female, is taken in nets about forty yards long, and seven or eight feet high. These birds are chiefly found in Lincolnshire and the Isle of Ely, where they come about the latter end of April, and disappear about Michaelmas. The male of this bird, which is known from all others of the kind by the great length of the feathers round his neck, is yet so various in his plumage, that it is said, no two ruffs were ever seen totally of the same colour. The nets in which these are taken, are supported by sticks, at an angle of near forty-five degrees, and placed either on dry ground, or in very shallow water, not remote from reeds: among these the fowler conceals himself, till the birds, enticed by a stale or stuffed bird, come under the nets; he then, by pulling a string, lets them fall, and they are taken: as are godwits knots and gray plover also in the same manner. When these birds are brought from under the net, they are not killed immediately, but fattened for the table, with bread and milk, hemp-seed, and sometimes boiled wheat; but if expedition be wanted, sugar is added, which will make them a lump of fat in a fortnight's time. They are kept, as observed before, in a dark room; and judgment is required in taking the proper time for killing them, when they are at the highest pitch of fatness: for, if that is neglected, the birds are apt to fall away. They are reckoned a very great delicacy; they sell for two shillings, or half-a-crown a piece; and are served up to the table with the train, like woodcocks, where we will leave them.

CHAPTER XI.

OF THE WATER-HEN, AND THE COOT.

BEFORE we enter upon water-fowls, properly so called, two or three birds claim our attention, which seem to form the shade between the web-footed tribe and those of the crane kind. These partake rather of the form than the habits of the crane; and, though furnished with long legs and necks, rather swim than wade. They cannot properly be called web-footed; nor yet are they entirely destitute of membranes, which fringe their toes on each side, and adapt them for swimming. The birds in question are, the Water-Hen and the Bald-Coot.

These birds have too near an affinity, not to be ranked in the same description. They are shaped entirely alike, their legs are long, and their thighs partly bare; their necks are proportionable, their wings short, their bills short and weak, their colour black, their foreheads bald and without feathers, and their habits are entirely the same. These, however, naturalists have thought proper to range in different classes, from very slight distinctions in their figure. The water-hen weighs but fifteen ounces; the coot twenty-four. The bald part of the forehead in the coot is black; in the water-hen it is of a beautiful pink colour. The toes of the water-hen are edged with a straight membrane; those of the coot have it scolloped and broader.

The differences in the figure are but slight; and those in their manner of living still less. The history of the one will serve for both. As birds of the crane kind are furnished with long wings, and easily change place, the water-hen, whose wings are short, is obliged to reside entirely near those places where her food lies: she cannot take those long journeys that most of the crane kind are seen to perform; compelled by her natural imperfections, as well perhaps as by inclination, she never leaves the side of the pond or the river in which she seeks for provision. Where the stream is selvaged with sedges, or the pond edged with shrubby trees, the water-hen is generally a resident there: she seeks her food along the grassy banks, and often along the surface of the water. With Shakspeare's Edgar, she drinks the green mantle of the standing pool; or, at least, seems to prefer those places where it is seen. Whether she makes pond-weed her food, or hunts among it for water-insects, which are found there in great abundance, is not certain. I have seen them when pond-weed was taken out of their stomach. She builds her nest upon low trees and shrubs, of sticks and fibres, by the water-side. Her eggs are sharp at one end, white, with a tincture of green, spotted with red. She lays twice or thrice in a summer; her young ones swim the moment they leave the egg, pursue their parent, and imitate all her manners. She rears, in this manner, two or three broods in a season: and when the young are grown up, she drives them off to shift for themselves.

As the coot is a larger bird, it is always seen in larger streams, and more remote from mankind. The water-hen seems to prefer inhabited situations: she keeps near ponds, moats, and pools of water near gentlemen's houses; but the coot keeps in rivers, and among rushy margined lakes. It there makes a nest of such weeds as the stream supplies, and lays them among the reeds, floating on the surface, and rising and falling with the water. The reeds among which it is built keep it fast; so that it is seldom washed into the middle of the stream. But if this happens, which is sometimes the case, the bird sits in her nest, like a mariner in his boat, and steers with her legs her cargo into the nearest harbour: there, having attained her port, she continues to sit in great tranquillity, regardless of the impetuosity of the current; and though the water penetrates her nest, she hatches her eggs in that wet condition.

The water hen never wanders; but the coot sometimes swims down the current, till it even reaches the sea. In this voyage these birds encounter a thousand dangers: as they cannot fly far, they are hunted by dogs and men; as they never leave the stream, they are attacked and destroyed by otters; they are preyed upon by kites and falcons; and they are taken in still greater numbers, in weirs made for catching fish; for these birds are led into the nets, while pursuing small fish and insects, which are their principal food. Thus Animated Nature affords a picture of universal invasion! Man destroys the otter, the otter destroys the coot, the coot feeds upon fish, and fish are universally the tyrants of each other!

To these birds, with long legs and finny toes, I will add one species more, with short legs and finny toes: I mean the Grebe. The entire resemblance of this bird's appetites and manners to those of the web-footed class, might justly induce me to rank it among them; but as it resembles those above described, in the peculiar form of its toes, and bears some similitude in its manners also, I will for once sacrifice method to brevity. The grebe is much larger than either of the former, and its plumage white and black: it differs also entirely in the shortness of its legs, which are made for swimming, and not walking: in fact, they are from the knee upward hid in the belly of the bird, and have consequently very little motion. By this mark, and by the scolloped fringe of the toes, may this bird be easily distinguished from all others.

As they are thus, from the shortness of their wings, ill formed for flying, and from the uncommon shortness of their legs, utterly unfitted for walking, they seldom leave the water, and chiefly frequent those broad shallow pools where their faculty of swimming can be turned to the greatest advantage, in fishing and seeking their prey.

They are chiefly, in this country, seen to frequent the meres of Shropshire and Cheshire; where they breed among reeds and flags, in a floating nest, kept steady by the weeds of the margin. The female is said to be a careful nurse of its young, being observed to feed them most assiduously with small eels; and when the little brood is tired, the mother will carry them either on her back or under her wings. This bird preys upon fish, and is almost perpetually diving It does not show much more than the head above water; and is very difficult to be shot, as it darts down on the appearance of the least danger. It is never seen on land; and, though disturbed ever so often, will not leave that lake, where alone, by diving and swimming, it can find food and security. It is chiefly sought for the skin of its breast, the plumage of which is of a most beautiful silvery white, and as glossy as satin. This part is made into tippets; but the skins are out of season about February, losing their bright colour; and in breeding-time their breasts are entirely bare.

BOOK VII.

OF WATER-FOWL.

CHAPTER I.

OF WATER-FOWL IN GENERAL.

IN settling the distinctions among the other classes of birds, there was some difficulty; one tribe encroached so nearly upon the nature and habitudes of another, that it was not easy to draw the line which kept them asunder: but in water-fowl Nature has marked them for us by a variety of indelible characters; so that it would be almost as unlikely to mistake a land-fowl for one adapted for living and swimming among the waters, as a fish for a bird.

The first great distinction in this class appears in the toes, which are webbed together for swimming. Those who have remarked the feet or toes of a duck, will easily conceive how admirably they are formed for making way in the water. When men swim, they do not open the fingers, so as to let the fluid pass through them; but closing them together, present one broad surface to beat back the water, and thus push their bodies along. What man performs by art, Nature has supplied to water-fowl; and, by broad skins, has webbed their toes together, so that they expand two broad oars to the water; and thus, moving them alternately, with the greatest ease paddle along. We must observe also, that the toes are so contrived, that as they strike backward, their broadest hollow surface beats the water; but as they gather them in again, for a second blow, their front surface contracts, and does not impede the bird's progressive motion.

As their toes are webbed in the most convenient manner, so are their legs also made most fitly for swift progression in the water. The legs of all are short, except the three birds described in a former chapter, namely, the flamingo, the avosetta, and the corrira: all which, for that reason, I have thought proper to rank among the crane kind, as they make little use of their toes in swimming. Except these, all web-footed birds have very short legs, and these strike, while they swim, with great facility. Were the leg long, it would act like a lever whose prop is placed to a disadvantage; its motions would be slow, and the labour of moving it considerable. For this reason the very few birds whose webbed feet are long, never make use of them in swimming: the web at the bottom seems only of service as a broad

Mallard, p. 221.

Brant Goose, p. 219.

Ankina, or Jacana, p. 169

Barnacle Goose, p. 218.

Teal, p. 221.

American Summer Duck, or Wood Duck, p. 222

To face p. 191, vol. iii

base, to prevent them from sinking while they walk in the mud, but it otherwise rather retards than advances their motion.

The shortness of the legs in the web-footed kinds, renders them as unfit for walking on land, as it qualifies them for swimming in their natural element. Their stay, therefore, upon land, is but short and transitory, and they seldom venture to breed far from the sides of those waters where they usually remain. In their breeding seasons, their young are brought up by the water-side, and they are covered with a warm down, to fit them for the coldness of their situation. The old ones also have a closer, warmer plumage than birds of any other class. It is of their feathers that our beds are composed, as they neither mat nor imbibe humidity, but are furnished with an animal oil that glazes their surface, and keeps each separate. In some, however, this animal oil is in too great abundance, and is as offensive from its smell, as it is serviceable for the purposes of household economy. The feathers, therefore, of all the penguin kind are totally useless for domestic purposes, as neither boiling nor bleaching can divest them of their oily rancidity. Indeed, the rancidity of all new feathers, of whatever water-fowl they be, is so disgusting that our upholsterers give near double the price for old feathers that they afford for new; to be free from smell, they must all be lain upon for some time, and their usual method is to mix the new and the old together.

This quantity of oil, with which most water-fowl are supplied, contributes also to their warmth in the moist element where they reside Their skin is generally lined with fat, so that with the warmth of the feathers externally, and this natural lining more internally, they are better defended against the changes or the inclemencies of the weather, than any other class whatever.

As, among land-birds, there are some found fitted entirely for depredation, and others for a harmless method of subsisting upon vegetables, so also, among these birds, there are tribes of plunderers that prey, not only upon fish, but sometimes upon water-fowl themselves. There are likewise more inoffensive tribes, that live upon insects and vegetables only. Some water-fowls subsist by making sudden stoops from above, to seize whatever fish comes near the surface; others again, not furnished with wings long enough to fit them for flight, take their prey by diving after it to the bottom.

From hence all water-fowl naturally fall into three distinctions. Those of the Gull kind, that, with long legs and round bills, fly along the surface to seize their prey: those of the Penguin kind, that, with round bills, legs hid in the abdomen, and short wings, dive after their prey: and, thirdly, those of the Goose kind, with flat broad bills, that lead harmless lives, and chiefly subsist upon insects and vegetables.

These are not speculative distinctions, made up for the arrangement of a system; but they are strongly and evidently marked by nature. The gull kind are active and rapacious; constantly, except when they breed, keeping upon the wing; fitted for a life of rapine, with sharp, straight bills for piercing, or hooked at the end for holding their fishy prey. In this class we may rank the Albatross, the Cormorant the Gannet or Soland Goose, the Shag, the Frigate-bird, the Great Brown Gull, and all the lesser tribe of gulls and sea swallows.

The Penguin kind, with appetites as voracious, bills as sharp, and equally eager for prey, are yet unqualified to obtain it by flight. Their wings are short, and their bodies large and heavy, so that they can neither run nor fly. But they are formed for diving in a very peculiar manner. Their feet are placed so far backward, and their legs so hid in the abdomen, that the slightest stroke sends them head foremost to the bottom of the water. To this class we may refer the Penguin, the Auk, the Skout, the Sea-turtle, the Bottlenose, and the Loon.

The Goose kind are easily distinguishable by their flat broad bills, covered with a skin; and their manner of feeding, which is mostly upon vegetables. In this class we may place the Swan, the Goose, the Duck, the Teal, the Widgeon, and all their numerous varieties.

In describing the birds of these three classes, I will put the most remarkable of each class at the beginning of their respective tribes, and give their separate history; then after having described the chiefs of the tribe, the more ordinary sorts will naturally fall in a body, and come under a general description, behind their leaders. But before I offer to pursue this methodical arrangement, I must give the history of a bird, that, from the singularity of its conformation, seems allied to no species, and should therefore be separately described—I mean the Pelican.

CHAPTER II.

OF THE PELICAN.

THE Pelican of Africa is much larger in the body than a swan, and somewhat of the same shape and colour. Its four toes are all webbed together, and its neck, in some measure, resembles that of a swan; but that singularity in which it differs from all other birds, is in the bill and the great pouch underneath, which are wonderful, and demand a distinct description. This enormous bill is fifteen inches from the point to the opening of the mouth, which is a good way back, behind the eyes. At the base the bill is somewhat greenish, but varies towards the end, being of a reddish blue. It is very thick in the beginning, but tapers off to the end, where it hooks downwards. The under chap is still more extraordinary; for to the lower edges of it hangs a bag, reaching the whole length of the bill to the neck, which is said to be capable of containing fifteen quarts of water. This bag the bird has a power of wrinkling up into the hollow of the under chap; but by opening the bill, and putting one's hand down into the bag, it may be distended at pleasure. The skin of which it is formed will then be seen of a bluish ash-colour, with many fibres and veins running over its surface. It is not covered with feathers, but a short downy substance as smooth and as soft as satin, and is attached all along the under edges of the chap, to be fixed backward to the neck of the bird by proper ligaments, and reaches near half way down. When this bag is empty it is not seen; but when the bird has fished with success, it is then incredible to what an extent it is often seen dilated. For the first thing the pelican does in fishing is to fill up the bag, and then it returns to digest its burden at leisure. When the bill is opened to its widest extent, a person may run his head into the bird's mouth, and conceal it in this monstrous pouch, thus adapted for very singular purposes. Yet this is nothing to what Ruysch assures us, who avers that a man has been seen to hide his whole leg, boot and all, in the monstrous jaws of one of these animals. At first appearance this would seem impossible, as the sides of the under chap, from which the bag depends, are not above an inch asunder when the bird's bill is first opened; but then they are capable of great separation; and it must necessarily be so, as the bird preys upon the largest fishes, and hides them by dozens in its pouch. Tertre affirms, that it will hide as many fish as will serve sixty hungry men for a meal.

Such is the formation of this extraordinary bird, which is a native of Africa and America. The pelican was once also known in Europe, particularly in Russia, but it seems to have deserted our coasts. This is the bird of which so many fabulous accounts have been propagated; such as its feeding its young with its own blood, and its carrying a provision of water for them in its great reservoir in the desert. But the absurdity of the first account answers itself; and as for the latter, the pelican uses its bag for very different purposes than that of filling it with water.

Its amazing pouch may be considered as analogous to the crop in other birds, with this difference, that as theirs lies at the bottom of the gullet, so this is placed at the top. Thus, as pigeons and other birds macerate their food for their young in their crops, and then supply them, so the pelican supplies its young by a more ready contrivance, and macerates their food in its bill, or stores it for its own particular sustenance.

The ancients were particularly fond of giving this bird admirable qualities and parental affections; struck, perhaps, with its extraordinary figure, they were willing to supply it with as extraordinary appetites, and having found it with a large reservoir, they were pleased with turning it to the most tender and parental uses. But the truth is, the pelican is a very heavy, sluggish, voracious bird, and very ill fitted to take those flights, or to make those cautious provisions for a distant time, which we have been told they do. Father Labat, who seems to have studied their manners with great exactness, has given us a minute history of this bird, as found in America, and from him I will borrow mine.

The pelican, says Labat, has strong wings, furnished with thick plumage of an ash-colour, as are the rest of the feathers over the whole body. Its eyes are very small, when compared to the size of its head; there is a sadness in its countenance, and its whole air is melancholy. It is as dull and reluctant in its motions, as the flamingo is sprightly and active. It is slow of flight; and when it rises to fly, performs it with difficulty and labour. Nothing, as it would seem, but the spur of necessity could make these birds change their situation, or induce them to ascend into the air; but they must either starve or fly.

They are torpid and inactive to the last degree, so that nothing can exceed their indolence but their gluttony; it is only from the stimulations of hunger that they are excited to labour; for otherwise they would continue always in fixed repose. When they have raised themselves about thirty or forty feet above the surface of the sea, they turn their head with one eye downwards, and continue to fly in that posture. As soon as they perceive a fish sufficiently near the surface, they dart down upon it with the swiftness of an arrow, seize it with unerring certainty, and store it up in their pouch. They then rise again, though not without great labour, and continue hovering and fishing, with their head on one side as before.

This work they continue with great effort and industry till their bag is full, and then they fly to land to devour and digest, at leisure, the fruits of their industry. This, however, it would appear, they are not long in performing; for towards night they have another hungry call, and they again reluctantly go to labour. At night, when their fishing is over, and the toil of the day crowned with success, these lazy birds retire a little way from the shore; and, though with the webbed feet and clumsy figure of a goose, they will be contented to perch no where but upon trees among the light and airy tenants of the forest. There they take their repose for the night; and often spend a great part of the day, except such times as they are fishing, sitting in dismal solemnity and as it would seem half asleep. Their attitude is, with the head resting upon their great bag, and that resting upon their breast. There they remain without motion, or once changing their situation, till the calls of hunger break their repose, and till they find it indispensably necessary to fill their magazine for a fresh meal. Thus their life is spent between sleeping and eating; and our author adds, that they are as foul as they are voracious, as they are every moment voiding excrements in heaps as large as one's fist.

The same indolent habits seem to attend them even in preparing for incubation, and defending their young when excluded. The female makes no preparation for her nest, nor seems to choose any place in preference to lay in; but drops her eggs on the bare ground to the number of five or six, and there continues to hatch them. Attached to the place, without any desire of defending her eggs or her young, she tamely sits and suffers them to be taken from under her. Now and then she just ventures to peck, or to cry out when a person offers to beat her off.

She feeds her young with fish macerated for some time in her bag, and when they cry, flies off for a new supply. Labat tells us, that he took two of these when very young, and tied them by a leg to a post stuck into the ground, where he had the pleasure of seeing the old one for several days come to feed them, remaining with them the greatest part of the day, and spending the night on the branch of a tree that hung over them. By these means they were all three become so familiar, that they suffered themselves to be handled; and the young ones very kindly accepted whatever fish he offered them. These they always put first into their bag, and then swallowed at their leisure.

It seems, however, that they are but disagreeable and useless domestics; their gluttony can scarcely be satisfied; their flesh smells very rancid; and tastes a thousand times worse than it smells. The native Americans kill vast numbers; not to eat, for they are not fit even for the banquet of a savage; but to convert their large bags into purses and tobacco-pouches. They bestow no small pains in dressing the skin with salt and ashes, rubbing it well with oil, and then forming it to their purpose. It thus becomes so soft and pliant, that the Spanish women sometimes adorn it with gold and embroidery to make work-bags of.

Yet, with all the seeming hebetude of this bird, it is not entirely incapable of instruction in a domestic state. Father Raymond assures us, that he has seen one so tame and well educated among the native Americans, that it would go off in the morning at the word of command, and return before night to its master, with its great paunch distended with plunder; a part of which the savages would make it disgorge, and a part they would permit it to reserve for itself.

"The Pelican," as Faber relates, "is not destitute of other qualifications. One of those which was brought alive to the Duke of Bavaria's court, where it lived forty years, seemed to be possessed of very uncommon sensations. It was much delighted in the company and conversation of men, and in music both vocal and instrumental: for it would willingly stand," says he, "by those that sung or sounded the trumpet; and stretching out its head, and turning its ear to the music, listened very attentively to its harmony, though its own voice was little pleasanter than the braying of an ass. Gesner tells us that the Emperor Maximilian had a tame pelican, which lived about eighty years, and that always attended his army on their march. It was one of the largest of the kind, and had a daily allowance by the Emperor's orders. As another proof of the great age to which the pelican lives, Aldrovandus makes mention of one of these birds that was kept several years at Mechlin, and was verily believed to be fifty years old.—We often see these birds at our shows about town.

CHAPTER III.

OF THE ALBATROSS, THE FIRST OF THE GULL KIND.

THOUGH this is one of the largest and most formidable birds of Africa and America, yet we have but few accounts to enlighten us on its history. The figure of the bird is thus described by Edwards:

"The body is rather larger than that of the pelican; and its wings, when extended, ten feet from tip to tip. The bill, which is six inches long, is yellowish, and terminates in a crooked point. The top of the head is of a bright brown; the back is of a dirty deep spotted brown; and the belly and under the wing is white; the toes which are webbed, are of a flesh colour."

Such are the principal traits in this bird's figure: but these lead us a very short way in its history; and our naturalists have thought fit to say nothing more. However, I am apt to believe this bird to be the same with that described by Wicquefort, under the title of the Alcatraz; its size, its colours, and its prey incline me to think so. He describes it as a kind of great gull, as large in the body as a goose, of a brown colour, with a long bill, and living upon fish, of which they kill great numbers.

This bird is an inhabitant of the tropical climates, and also beyond them as far as the Straits of Magellan in the South Seas. It is one of the most fierce and formidable of the aquatic tribe, not only living upon fish, but also such small water-fowl as it can take by surprise. It preys, as all the gull kind do, upon the wing, and chiefly pursues the flying fish, that are forced from the sea by the dolphins. The ocean in that part of the world presents a very different appearance from the seas with which we are surrounded. In our seas we see nothing but a dreary expanse, ruffled by winds, and seemingly forsaken by every class of Animated Nature. But the tropical seas, and the distant south latitudes beyond them, are all alive with birds and fishes, pursuing and pursued. Every various species of the gull kind are there seen hovering on the wing, at a thousand miles distance from the shore. The flying-fish are every moment rising to escape from their pursuers of the deep, only to encounter equal dangers in the air. Just as they rise the dolphin is seen to dart after them, but generally in vain; the gull has more frequent success, and often takes them at their rise, while the albatross pursues the gull, and obliges it to relinquish its prey: so that the whole horizon presents but one living picture of rapacity and evasion.

So much is certain; but how far we are to credit Wicquefort, in what he adds concerning this bird, the reader is left to determine. "As these birds, except when they breed, live entirely remote from land, so they are often seen, as it should seem, sleeping in the air. At night, when they are pressed by slumber, they rise into the clouds as high as they can; there, putting their head under one wing, they beat the air with the other, and seem to take their ease. After a time, however, the weight of their bodies, only thus half supported, brings them down; and they are seen descending, with a rapid motion, to the surface of the sea. Upon this they again put forth their efforts to rise; and thus alternately ascend and descend at their ease. But it sometimes happens," says my author, "that, in these slumbering flights, they are off their guard, and fall upon deck, where they are taken."

What truth there may be in this account, I will not take it upon me to determine: but certain it is, that few birds float upon the air with more ease than the albatross, or support themselves a longer time in that element. They seem never to feel the accesses of fa

Cormorant, p. 197.

Pelican, p. 192.

To face p. 197, vol. iii.

tigue; but, night and day upon the wing, are always prowling, yet always emaciated and hungry.

But though this bird be one of the most formidable tyrants of the deep, there are some associations which even tyrants themselves form, to which they are induced either by caprice or necessity. The albatross seems to have a peculiar affection for the penguin, and a pleasure in its society. They are always seen to choose the same places of breeding; some distant, uninhabited island, where the ground slants to the sea, as the penguin is not formed either for flying or climbing. In such places their nests are seen together, as if they stood in need of mutual assistance and protection. Captain Hunt, who for some time commanded at our settlement upon Falkland Islands, assures me, that he was often amazed at the union preserved between these birds, and the regularity with which they built together. In that bleak and desolate spot, where the birds had long continued undisturbed possessors, and noway dreaded the encroachment of men, they seemed to make their abode as comfortable as they expected it to be lasting. They were seen to build with an amazing degree of uniformity; their nests covering fields by thousands, and resembling a regular plantation. In the middle, on high, the albatross raised its nests, on heath, sticks, and long grass, about two feet above the surface: and around this the penguins made their lower settlements, rather in holes in the ground, and most usually eight penguins to one albatross. Nothing is a stronger proof of Mr. Buffon's fine observation, that the presence of man not only destroys the society of meaner animals, but their instincts also. These nests are now, I am told, totally destroyed; the society is broke up; and the albatross and penguin have gone to breed upon more desert shores, in greater security.

CHAPTER IV.

THE CORMORANT.

THE Cormorant is about the size of a large Muscovy duck, and may be distinguished from all other birds of this kind, by its four toes being united by membranes together; and by the middle toe being toothed or notched, like a saw, to assist it in holding its fishy prey. The head and neck of this bird are of a sooty blackness; and the body thick and heavy, more inclining in figure to that of the goose than the gull. The bill is straight, till near the end, where the upper chap bends into a hook.

But notwithstanding the seeming heaviness of its make, there are few birds more powerfully predaceous. As soon as the winter approaches, they are seen dispersed along the sea-shore, and ascending up the mouths of fresh-water rivers, carrying destruction to all the finny tribe. They are most remarkably voracious, and have a most sudden digestion. Their appetite is for ever craving, and never satisfied. This gnawing sensation may probably be increased by the great quantity of small worms that fill their intestines, and which their unceasing gluttony contributes to engender.

Thus formed with grossest appetites, this unclean bird has the most rank and disagreeable smell, and is more fœtid than even carrion, when in its most healthful state. Its form, says an ingenious modern, is disagreeable; its voice is hoarse and croaking; and all its qualities obscene. No wonder then that Milton should make Satan personate this bird, when he sent him upon the basest purposes, to survey with pain the beauties of Paradise, and to sit devising death on the tree of life.* It has been remarked, however, of our poet, that the making a water-fowl perch upon a tree, implied no great acquaintance with the history of Nature. In vindication of Milton, Aristotle expressly says, that the cormorant is the only water-fowl that sits on trees. We have already seen the pelican of this number; and the cormorant's toes seem as fit for perching upon trees as for swimming; so that our epic bard seems to have been as deeply versed in natural history as in criticism.

Indeed, this bird seems to be of a multiform nature; and wherever fish are to be found, watches their migrations. It is seen as well by land as sea; it fishes in fresh-water lakes, as well as in the depths of the ocean; it builds in the cliffs of rocks, as well as on trees; and preys not only in the daytime, but by night.

Its indefatigable nature, and its great power in catching fish, were probably the motives that induced some nations to breed this bird up tame, for the purposes of fishing; and Willoughby assures us, it was once used in England for that purpose. The description of their manner of fishing is thus delivered by Faber. "When they carry them out of the rooms where they are kept, to the fish-pools, they hoodwink them, that they may not be frighted by the way. When they are come to the rivers, they take off their hoods; and having tied a leather thong round the lower part of their necks, that they may not swallow down the fish they catch, they throw them into the river. They presently dive under water; and there for a long time with wonderful swiftness, pursue the fish; and when they have caught them, rise to the top of the water, and pressing the fish lightly with their bills, swallow them; till each bird hath, after this manner, devoured five or six fishes. Then their keepers call them to the fist, to which they readily fly; and, one after another, vomit up all their fish, a little bruised with the first nip given in catching them. When they have done fishing, setting the birds on some high place, they loose the string from their necks, leaving the passage to the stomach free and open; and, for their reward, they throw them part of their prey; to each one or two fishes, which they will catch most dexterously, as they are falling in the air."

At present, the cormorant is trained up in every part of China for the same purpose, where there are many lakes and canals. "To this end," says Le Comte, "they are educated as men rear up spaniels or hawks, and one man can easily manage a hundred. The fisher carries them out into the lake, perched on the gunnel of his boat, where they continue tranquil, and expecting his orders with patience. When arrived at the proper place, at the first signal given, each flies a different way to fulfil the task assigned it. It is very pleasant, on this occasion, to behold with what sagacity they portion out the lake or the canal where they are upon duty. They hunt about, they plunge, they rise a hundred times to the surface, until they have at last found their prey. They then seize it with their beak by the middle, and carry it without fail to their master. When the fish is too large, they then give each other mutual assistance: one seizes it by the head, the other by the tail, and in this manner carry it to the boat together. There the boat-man stretches out one of his long oars, on which they perch, and being delivered of their burthen, they fly off to pursue their sport. When they are wearied, he lets them rest for a while; but they are never fed till their work is over. In this manner they supply a very plentiful table; but still their natural gluttony cannot be reclaimed even by education. They have always, while they fish, the same string fastened round their throats, to prevent them from devouring their prey, as otherwise they would at once satiate themselves, and discontinue their pursuit the moment they had filled their bellies."

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* Vide Pennant's Zoology, p. 477

As for the rest, the cormorant is the best fisher of all birds; and though fat and heavy with the quantity it devours, is nevertheless generally upon the wing. The great activity with which it pursues, and from a vast height drops down to dive after its prey, offers one of the most amusing spectacles to those who stand upon a cliff on the shore. This large bird is seldom seen in the air, but where there are fish below; but then they must be near the surface, before it will venture to souse upon them. If they are at a depth beyond what the impetus of its flight makes the cormorant capable of diving to, they certainly escape him; for this bird cannot move so fast under water, as the fish can swim. It seldom, however, makes an unsuccessful dip; and is often seen rising heavily, with a fish larger than it can readily devour. It sometimes also happens, that the cormorant has caught the fish by the tail; and consequently the fins prevent its being easily swallowed in that position. In this case, the bird is seen to toss its prey above its head, and very dexterously to catch it when descending, by the proper end, and so swallow it with ease.

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CHAPTER V.

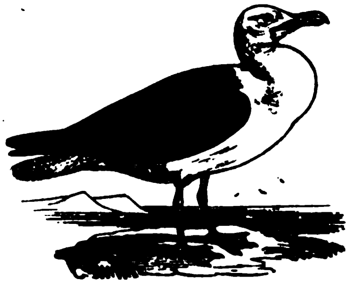
OF THE GANNET OR SOLAND GOOSE.

THE Gannet is of the size of a tame goose, but its wings much longer, being six feet over. The bill is six inches long, straight most to the point, where it inclines down, and the sides are irregularly jagged, that it may hold its prey with greater security. It differs from the cormorant in size, being larger; and its colour, which is chiefly white; and by its having no nostrils, but in their place a long furrow that reaches almost to the end of the bill. From the corner of the mouth is a narrow slip of black bare skin, that extends to the hind part of the head; beneath the skin is another, that, like the pouch of the pelican, is dilatable, and of size sufficient to contain five or six entire herrings, which in the breeding season it carries at once to its mate or its young.

These birds, which subsist entirely upon fish, chiefly resort to those uninhabited islands, where their food is found in plenty, and men seldom come to disturb them. The islands to the north of Scotland, the Skelig islands of the coasts of Kerry, in Ireland, and those that lie in the north sea off Norway, abound with them. But it is on the Bass island, in the Frith of Edinburgh, where they are seen in the greatest abundance. "There is a small island," says the celebrated Harvey, "called the Bass, not more than a mile in circumference The surface is almost wholly covered during the months of May and June with their nests, their eggs, and young. It is scarcely possible to walk without treading on them: the flocks of birds upon the wing, are so numerous, as to darken the air, like a cloud; and their noise is such, that one cannot, without difficulty, be heard by the person next to him. When one looks down upon the sea from the precipice, its whole surface seems covered with infinite numbers of birds of different kinds, swimming and pursuing their prey. If, in sailing round the island, one surveys its hanging cliffs, in every crag, or fissure of the broken rocks, may be seen innumerable birds, of various sorts and sizes, more than the stars of heaven, when viewed in a serene night. If they are viewed at a distance, either receding, or in their approach to the island, they seem like one vast swarm of bees."

They are not less frequent upon the rocks of St. Kilda. Martin assures us, that the inhabitants of that small island consume annually near twenty-three thousand young birds of this species, beside an amazing quantity of their eggs. On these they principally subsist throughout the year; and from the number of these visitants, make an estimate of their plenty for the season. They preserve both the eggs and fowls in small pyramidal stone buildings, covering them with turf ashes, to prevent the evaporation of their moisture.

The gannet is a bird of passage. In winter it seeks the more southern coasts of Cornwall, hovering over the shoals of herrings and pilchards that then come down from the northern seas; its first appearance in the northern islands is in the beginning of spring; and it continues to breed till the end of summer. But, in general, its motions are determined by the migrations of the immense shoals of herrings that come pouring down at that season through the British Channel, and supply all Europe, as well as this bird, with their spoil The gannet assiduously attends the shoal in their passage, keeps with them in their whole circuit round our island, and shares with our fishermen this exhaustless banquet. As it is strong of wing, it never comes near the land; but is constant to its prey. Wherever the gannet is seen, it is sure to announce to the fishermen the arrival of



Gull, p. 203.

Flamingo, p. 177.

To face p. 201, vol. iii.

the finny tribe: they then prepare their nets, and take the herrings by millions at a draught; while the gannet, who came to give the first information, comes, though an unbidden guest, and often snatches its prey from the fisherman even in his boat. While the fishing season continues, the gannets are busily employed; but when the pilchards disappear from our coasts, the gannet takes its leave to keep them company.

The cormorant has been remarked for the quickness of his sight; yet in this the gannet seems to exceed him. It is possessed of a transparent membrane under the eyelid, with which it covers the whole eye at pleasure, without obscuring the sight in the smallest degree. This seems a necessary provision for the security of the eyes of so weighty a creature, whose method of taking its prey, like that of the cormorant, is by darting headlong down from a height of a hundred feet or more into the water to seize it.—These birds are sometimes taken at sea, by fastening a pilchard to a board, which they leave floating. The gannet instantly pounces down from above upon the board, and is killed or maimed by the shock of a body where it expected no resistance.[*]

These birds breed but once a year, and lay but one egg, which being taken away, they lay another; if that is also taken, then a third; but never more for that season. Their egg is white, and rather less than that of the common goose; and their nest large, composed of such substances as are found floating on the surface of the sea. The young birds, during the first year, differ greatly in colour from the old ones; being of a dusky hue, speckled with numerous triangular white spots; and at that time resembling the colours of the speckled diver.

The Bass island, where they chiefly breed, belongs to one proprietor; so that care is taken never to fright away the birds when laying, or to shoot them upon the wing. By that means, they are so confident as to alight and feed their young ones close beside you. They feed only upon fish, as was observed; yet the young gannet is counted a great dainty by the Scots, and is sold very dear; so that the lord of the islet makes a considerable annual profit by the sale.

CHAPTER VI.

OF THE SMALLER GULLS AND PETRELS.

HAVING described the manners of the great ones of this tribe, those of the smaller kinds may be easily inferred. They resemble the more powerful in their appetites for prey, but have not such certain methods of obtaining it. In general, therefore, the industry of this tribe, and their audacity, increase in proportion to their imbecility; the great gulls live at the most remote distance from man; the smaller are obliged to reside wherever they can take their prey; and to come into the most populous places, when solitude can no longer grant them a supply. In this class we may place the Gull, properly so called, of which there are above twenty different kinds; the Petrel, of which there are three; and the Sea-swallow, of which there are as many. The gulls may be distinguished by an angular knob on the lower chap; the petrels, by their wanting this knob; and the sea-swallows by their bills, which are straight, slender, and sharp pointed. They all, however, agree in their appetites, and their places of abode

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[*] Mr. Pennant says, that one of these birds flying over Penzance in Cornwall, saw some pilchards lying on a fir plank, where they had been placed for curing; and darting itself down with great violence, it struck its bill quite through an inch and quarter-plank: it was killed on the spot.

The gull, and all its varieties, is very well known in every part of the kingdom. It is seen with a slow-sailing flight, hovering over rivers to prey upon the smaller kinds of fish; it is seen following the ploughman in fallow fields to pick up insects; and when living animal food does not offer, it has even been known to eat carrion, and whatever else of the kind that offers. Gulls are found in great plenty in every place; but it is chiefly round our boldest rockiest shores that they are seen in the greatest abundance; it is there that the gull breeds and brings up its young; it is there that millions of them are heard screaming with discordant notes for months together.

Those who have been much upon our coasts know that there are two different kinds of shores; that which slants down to the water with a gentle declivity, and that which rises with a precipitate boldness, and seems set as a bulwark to repel the force of the invading deeps. It is to such shores as these that the whole tribe of the gull kind resort, as the rocks offer them a retreat for their young, and the sea a sufficient supply. It is in the cavities of these rocks, of which the shore is composed, that the vast variety of sea-fowls retire to breed in safety. The waves beneath, that continually beat at the base, often wear the shore into an impending boldness; so that it seems to jut out over the water, while the raging of the sea makes the place inaccessible from below. These are the situations to which sea-fowl chiefly resort, and bring up their young in undisturbed security.

Those who have never observed our boldest coasts, have no idea of their tremendous sublimity. The boasted works of art, the highest towers, and the noblest domes, are but ant-hills when put in comparison: the single cavity of a rock often exhibits a coping higher than the ceiling of a Gothic cathedral. The face of the shore offers to the view a wall of massive stone, ten times higher than our tallest steeples. What should we think of a precipice three quarters of a mile in height? and yet the rocks of St. Kilda are still higher! What must be our awe to approach the edge of that impending height, and to look down on the unfathomable vacuity below; to ponder on the terrors of falling to the bottom, where the waves that swell like mountains are scarcely seen to curl on the surface, and the roar of an ocean a thousand leagues broad appears softer than the murmur of a brook! It is in these formidable mansions that myriads of sea-fowls are for ever seen sporting, flying in security down the depth, half a mile beneath the feet of the spectator. The crow and the chough avoid those frightful precipices; they choose smaller heights, where they are less exposed to the tempest; it is the cormorant, the gannet, the tarrock, and the terne, that venture to these dreadful retreats, and claim an undisturbed possession. To the spectator from above, those birds, though some of them are above the size of an eagle, seem scarcely as large as a swallow, and their loudest screaming is scarcely perceptible.

But the generality of our shores are not so formidable. Though they may rise two hundred fathoms above the surface, yet it often happens that the water forsakes the shore at the departure of the tide, and leaves a noble and delightful walk for curiosity on the beach. Not to mention the variety of shells with which the sand is strewed, the lofty rocks that hang over the spectator's head, and that seem but just kept from falling, produce in him no unpleasing gloom. If to this be added the fluttering, the screaming, and the pursuits of myriads of water-birds, all either intent on the duties of incubation, or roused at the presence of a stranger, nothing can compose a scene of more peculiar solemnity. To walk along the shore when the tide is departed, or to sit in the hollow of a rock when it is come in, attentive to the various sounds that gather on every side, above and below, may raise the mind to its highest and noblest exertions. The solemn roar of the waves swelling into, and subsiding from, the vast caverns beneath, the piercing note of the gull, the frequent chatter of the guillemot, the loud note of the hawk, the scream of the heron, and the hoarse deep periodical croaking of the cormorant, all unite to furnish out the grandeur of the scene, and turn the mind to HIM who is the essence of all sublimity.

Yet it often happens that the contemplation of a sea-shore produces ideas of an humbler kind, yet still not unpleasing. The various arts of these birds to seize their prey, and sometimes to elude their pursuers, their society among each other, and their tenderness and care of their young, produce gentler sensations. It is ridiculous also now and then to see their various ways of imposing upon each other. It is common enough, for instance, with the arctic gull to pursue the lesser gulls so long that they drop their excrements through fear, which the hungry hunter quickly gobbles up before it ever reaches the water. In breeding, too, they have frequent contests; one bird who has no nest of her own, attempts to dispossess another, and put herself in the place. This often happens among all the gull kind: and I have seen the poor bird, thus displaced by her more powerfu invader, sit near the nest in pensive discontent, while the other seemed quite comfortable in her new habitation. Yet this place of pre-eminence is not easily obtained; for the instant the invader goes to snatch a momentary sustenance, the other enters upon her own, and always ventures another battle before she relinquishes the justness of her claim. The contemplation of a cliff thus covered with hatching birds, affords a very agreeable entertainment; and as they sit upon the ledges of the rocks, one above another, with their white breasts forward, the whole groupe has not unaptly been compared to an apothecary's shop.

These birds, like all others of the rapacious kind, lay but few eggs and hence, in many places, their number is daily seen to diminish The lessening of so many rapacious birds may, at first sight, appear a benefit to mankind; but when we consider how many of the natives of our islands are sustained by their flesh, either fresh or salted, we shall find no satisfaction in thinking that these poor people may in time lose their chief support. The gull, in general, as was said, builds on the ledges of rocks, and lays from one egg to three, in a nest formed of long grass and sea-weed. Most of the kind are fishy tasted, with black stringy flesh; yet the young ones are better food: and of these, with several other birds of the penguin kind, the poor inhabitants of our northern islands make their wretched banquets. They have been long used to no other food; and even salted gull can be relished by those who know no better. Almost all delicacy is a relative thing, and the man who repines at the luxuries of a well-served table, starves not for want, but from comparison. The luxuries of the poor are indeed coarse to us, yet still they are luxuries to those ignorant of better; and it is probable enough that a Kilda or a Feroe man may be found to exist, outdoing Apicius himself, in consulting the pleasures of the table. Indeed, if it be true, that such meat as is the most dangerously earned, is the sweetest, no man can dine so luxuriously as these, as none venture so hardily in the pursuit of a dinner. In Jacobson's History of the Feroe Islands, we have an account of the method in which those birds are taken; and I will deliver it in his own simple manner.

" It cannot be expressed with what pains and danger they take these birds in those high, steep cliffs, whereof many are two hundred fathoms high. But there are men apt by nature, and fit for the work, who take them usually in two manners: they either climb from below into these high promontories that are as steep as a wall, or they let themselves down with a rope from above. When they climb from below, they have a pole five or six ells long, with an iron hook at the end, which they that are below in the boat, or on the cliff, fasten to the man's girdle, helping him up thus to the highest place where he can get footing; afterward they also help up another man, and thus several climb up as high as possibly they can; and, where they find difficulty, they help each other up, by thrusting one another up with their poles. When the first hath taken footing, he draws the other up to him, by the rope fastened to his waist; and so they proceed till they come to the place where the birds build. They there go about as well as they can, in those dangerous places, the one holding the rope at one end, and fixing himself to the rock, the other going at the other end from place to place. If it should happen that he chanceth to fall, the other that stands firm keeps him up, and helps him up again. But if he passeth safe, he likewise fastens himself till the other has passed the same dangerous place also. Thus they go about the cliffs after birds as they please. It often happeneth, however, (the more is the pity) that when one doth not stand fast enough, or is not sufficiently strong to hold up the other in his fall, that they both fall down and are killed. In this manner some do perish every year."

Mr. Peter Clanson, in his description of Norway, writes, that there was anciently a law in that country, that whosoever climbed so on the cliffs that he fell down and died, if the body was found before burial, his next kinsman should go the same way; but if he durst not, or could not do it, the dead body was not then to be buried in sanctified earth, as the person was too full of temerity, and his own destroyer.

"When the fowlers are come, in the manner aforesaid, to the birds within the cliffs, where people seldom come, the birds are so tame that they take them with their hands, for they will not readily leave their young. But when they are wild, they cast a net, with which they are provided, over them, and entangle them therein. In the mean time, there lieth a boat beneath in the sea, wherein they cast the birds killed; and in this manner they can in a short time fill a boat with fowl. When it is pretty fair weather, and there is good fowling, the fowlers stay in the cliff seven or eight days together; for there are here and there holes in the rocks, where they can safely rest; and they have meat let down to them with a line from the top of the mountain. In the mean time some go every day to them, to fetch home what they have taken.

"Some rocks are so difficult, that they can in no manner get unto them from below; wherefore they seek to come down thereunto from above. For this purpose they have a rope eighty or a hundred fathoms long, made of hemp, and three fingers thick. The fowler maketh the end of this fast about his waist, and between his legs, so that he can sit thereon, and is thus let down, with the fowling staff in his hand. Six men hold by the rope, and let him easily down, laying a large piece of wood on the brink of the rock, upon which the rope glideth, that it may not be worn to pieces by the hard and rough edge of the stone. They have, besides, another small line, that is fastened to the fowler's body; on which he pulleth, to give them notice how they should let down the great rope, either lower or higher; or to hold still, that he may stay in the place whereunto he is come. Here the man is in great danger, because of the stones that are loosened from the cliff, by the swinging of the rope, and he cannot avoid them. To remedy this, in some measure, he hath usually on his head a seaman's thick and shaggy cap, which defends him from the blows of the stones, if they be not too big; and then it costeth him his life: nevertheless, they continually put themselves in that danger, for the wretched body's food sake, hoping in God's mercy and protection, unto which the greatest part of them do devoutly recommend themselves when they go to work: otherwise, they say, there is no other great danger in it, except that it is a toilsome and artificial labour; for he that hath not learned to be so let down, and is not used thereto, is turned about with the rope, so that he soon groweth giddy, and can do nothing; but he that hath learned the art, considers it as a sport, swings himself on the rope, sets his feet against the rock, casts himself some fathoms from thence, and shoots himself to what place he will; he knows where the birds are, he understands how to sit on the line in the air, and how to hold the fowling-staff in his hand; striking therewith the birds that come or fly away: and when there are holes in the rocks, and it stretches itself out, making underneath as a ceiling under which the birds are, he knoweth how to shoot himself in among them, and there take firm footing. There when he is in these holes, he maketh himself loose of the rope which he fastens to a crag of the rock, that it may not slip from him to the outside of the cliff. He then goes about in the rock, taking the fowl either with his hands or the fowling-staff. Thus, when he hath killed as many birds as he thinks fit, he ties them in a bundle, and fastens them to a little rope, giving a sign, by pulling, that they should draw them up. When he has wrought thus the whole day, and desires to get up again, he sitteth once more upon the great rope, giving a new sign that they should pull him up; or else he worketh himself up, climbing along the rope, with his girdle full of birds. It is also usual, where there are not folks enough to hold the great rope, for the fowler to drive a post sloping into the earth, and to make a rope fast thereto, by which he lets himself down without any body's help, to work in the manner aforesaid. Some rocks are so formed that the person can go into their cavities by land.

"These manners are more terrible and dangerous to see than to describe; especially if one considers the steepness and height of the rocks, it seeming impossible for a man to approach them, much less to climb or descend. In some places, the fowlers are seen climbing where they can only fasten the ends of their toes and fingers; not shunning such places, though there be a hundred fathom between them and the sea. It is a dear meat for these poor people, for which they must venture their lives; and many, after long venturing, do at last perish therein.

"When the fowl is brought home, a part thereof is eaten fresh; another part, when there is much taken, being hung up for winter provision. The feathers are gathered to make merchandize of, for other expenses. The inhabitants get a great many of these fowls, as God giveth his blessing and fit weather. When it is dark and hazy they take most; for then the birds stay in the rocks: but in clear weather, and hot sun-shine, they seek the sea. When they prepare to depart for the season, they keep themselves most there, sitting on the cliffs towards the sea-side, where people get at them sometimes with boats, and take them with fowling-staves."

Such is the account of this historian; but we are not to suppose that all the birds caught in this manner are of the gull kind: on the contrary, numbers of them are of the penguin kind; auks, puffins, and guillemots. These all come, once a season, to breed in these recesses and retire in winter to fish in more southern climates.

CHAPTER VII.

OF THE PENGUIN KIND: AND FIRST, OF THE GREAT MAGELLANIC PENGUIN.

THE gulls are long-winged, swift flyers, that hover over the most extensive seas, and dart down upon such fish as approach too near the surface. The penguin kind are but ill fitted for flight, and still less for walking. Every body must have seen the awkward manner in which a duck, either wild or tame, attempts to change place: they must recollect with what softness and ease a gull or a kite waves its pinions, and with what a coil and flutter the duck attempts to move them; how many strokes it is obliged to give, in order to gather a little air; and even when it is thus raised, how soon it is fatigued with the force of its exertions, and obliged to take rest again. But the duck is not, in its natural state, half so unwieldy an animal as the whole tribe of the penguin kind. Their wings are much shorter, more scantily furnished with quills, and the whole pinion placed too forward to be usefully employed. For this reason, the largest of the penguin kind, that have a thick heavy body to raise, cannot fly at all. Their wings serve them rather as paddles to help them forward, when they attempt to move swiftly, and in a manner walk along the surface of the water. Even the smallest kinds seldom fly by choice; they flutter their wings with the swiftest efforts without making way; and though they have but a small weight of body to sustain, yet they seldom venture to quit the water, where they are provided with food and protection.

As the wings of the penguin tribe are unfitted for flight, their legs are still more awkwardly adapted for walking. This whole tribe have all above the knee hid within the belly: and nothing appears but two short legs, or feet, as some would call them, that seem stuck under the rump, and upon which the animal is very awkwardly supported. They seem, when sitting, or attempting to walk, like a dog that has been taught to sit up, or to move a minuet. Their short legs drive the body in progression from side to side; and were they not assisted by their wings, they could scarcely move faster than a tortoise.

This awkward position of the legs, which so disqualifies them for living upon land, adapts them admirably for a residence in water. In that, the legs, placed behind the moving body, pushes it forward with the greater velocity; and these birds, like Indian canoes, are the swiftest in the water, by having their paddles in the rear. Our sailors, for this reason, give these birds the very homely, but expressive, name of *arse-feet.*

Nor are they less qualified for diving than swimming. By ever so little inclining their bodies forward, they lose their centre of gravity and every stroke from their feet only tends to sink them the faster In this manner they can either dive at once to the bottom, or swim between two waters, where they continue fishing for some minutes, and then ascending, catch an instantaneous breath, to descend once more to renew their operations. Hence it is, that these birds, which are so defenceless, and so easily taken by land, are impregnable by water. If they perceive themselves pursued in the least, they instantly sink, and show nothing more than their bills, till the enemy is withdrawn. Their very internal conformation assists their power of keeping long under water. Their lungs are fitted with numerous vacuities, by which they can take in a very large inspiration; and this probably serves them for a length of time.

As they never visit land, except when they come to breed, their feathers take a colour from their situation. That part of them which has been continually bathed in the water, is white; while their backs and wings are of different colours, according to the different species. They are also covered more warmly all over the body with feathers, than any other birds whatever; so that the sea seems entirely their element: and but for the necessary duties of propagating their species, we should scarcely have the smallest opportunity of seeing them, and should be utterly unacquainted with their history.

Of all this tribe, the Magellanic Penguin is the largest, and the most remarkable. In size it approaches near that of a tame goose. It never flies, as its wings are very short, and covered with stiff hard feathers, and are always seen expanded, and hanging uselessly down by the bird's sides. The upper part of the head, back, and rump, are covered with stiff black feathers; while the belly and breast, as is common with all of this kind, are of a snowy whiteness, except a line of black that is seen to cross the crop. The bill, which from the base to about half way is covered with wrinkles, is black, but marked crosswise with a stripe of yellow. They walk erect, with their heads on high, their fin-like wings hanging down like arms; so that to see them at a distance, they look like so many children with white aprons. From hence they are said to unite in themselves the qualities of men, fowls, and fishes. Like men, they are upright; like fowls, they are feathered; and like fishes, they have fin-like instruments, that beat the water before, and serve for all the purposes of swimming, rather than flying.

They feed upon fish; and seldom come ashore, except in the breeding season. As the seas in that part of the world abound with a variety, they seldom want food; and their extreme fatness seems a proof of the plenty in which they live. They dive with great rapidity, and are voracious to a great degree. One of them, described by Clusius, though but very young, would swallow an entire herring at a mouthful, and often three successively before it was appeased. In consequence of this gluttonous appetite, their flesh is rank and fishy; though our sailors say, that *it is pretty good eating*. In some the flesh is so tough, and the feathers so thick, that they stand the blow of a scimitar without injury.

They are a bird of society; and, especially when they come on shore, they are seen drawn up in rank and file, upon the ledge of a rock, standing together with the albatross, as if in consultation. This is previous to their laying, which generally begins, in that part of the world, in the month of November. Their preparations for laying are attended with no great trouble, as a small depression in the earth, without any other nest, serves for this purpose. The warmth of their feathers and the heat of their bodies are such, that the progress of incubation is carried on very rapidly.

But there is a difference in the manner of this bird's nestling in other countries, which I can only ascribe to the frequent disturbances it has received from man or quadrupeds in its recesses. In some places, instead of contenting itself with a superficial depression in the earth, the penguin is found to burrow two or three yards deep . in other places it is seen to forsake the level, and to clamber up the ledge of a rock, where it lays its egg, and hatches it in that bleak exposed situation. These precautions may probably have been taken, in consequence of dear-bought experience. In those countries where the bird fears for her own safety, or that of her young, she may providently provide against danger, by digging, or even by climbing; for both which she is but ill adapted by nature. In those places, however, where the penguin has had but few visits from man, her nest is made, with the most confident security, in the middle of some large plain, where they are seen by thousands. In that unguarded situation, neither expecting nor fearing-a powerful enemy, they continue to sit brooding; and even when man comes among them, have at first no apprehension of their danger. Some of this tribe have been called, by our seamen, *the Booby*, from the total insensibility which they show when they are sought to their destruction. But it is not considered that these birds have never been taught to know the dangers of a human enemy : it is against the fox or the vulture that they have learned to defend themselves; but they have no idea of injury from a being so very unlike their natural opposers. The penguins, therefore, when our seamen first came among them, tamely suffered themselves to be knocked on the head, without even attempting an escape. They have stood to be shot at in flocks, without offering to move, in silent wonder, till every one of their number has been destroyed. Their attachment to their nests was still more powerful ; for the females tamely suffered the men to approach and take their eggs, without any resistance. But the experience of a few of those unfriendly visits, has long since taught them to be more upon their guard in choosing their situations; or to leave those retreats where they were so little able to oppose their invaders.

The penguin lays but one egg; and, in frequented shores, is found to burrow like a rabbit : sometimes three or four take possession of one hole, and hatch their young together. In the holes of the rocks, where nature has made them a retreat, several of this tribe, as Linnæus assures us, are seen together. There the females lay their single egg, in a common nest, and sit upon this, their general possession, by turns ; while one is placed as a sentinel, to give warning of approaching danger. The egg of the penguin, as well as of all this tribe, is very large for the size of the bird, being generally found bigger than that of a goose. But as there are many varieties of the penguin, and as they differ in size, from that of a Muscovy duck to a swan, the eggs differ in the same proportion.

CHAPTER VIII.

OF THE AUK, PUFFIN, AND OTHER BIRDS OF THE PENGUIN KIND

OF a size far inferior to the penguin, but with nearly the same form, and exactly of the same appetites and manners, there is a very numerous tribe. These frequent our shores, and, like the penguin have their legs placed behind. They have short wings, which are not totally incapable of flight; with round bills for seizing their prey, which is fish. They live upon the water, in which they are continually seen diving; and seldom venture upon land, except for the purposes of continuing their kind.

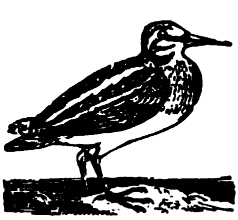
The first of this smaller tribe is the Great Northern Diver, which is nearly the size of a goose: it is beautifully variegated all over with many stripes, and differs from the penguin, in being much slenderer, and more elegantly formed. The Gray Speckled Diver does not exceed the size of a Muscovy duck; and, except in size, greatly resembles the former. The Auk, which breeds on the islands of St. Kilda, and chiefly differs from the penguin in size and colour: it is smaller than a duck; and the whole of the breast and belly, as far as the middle of the throat, is white. The Guillemot is about the same size; it differs from the auk, in having a longer, a slenderer, and a straighter bill. The Scarlet-Throated Diver may be distinguished by its name; and the Puffin, or Coulterneb, is one of the most remarkable birds we know.

Words cannot easily describe the form of the bill of the puffin, which differs so greatly from that of any other bird. Those who have seen the coulter of a plough, may form some idea of the beak of this odd-looking animal. The bill is flat; but, very different from that of a duck, its edge is upwards: it is of a triangular figure, and ending in a sharp point, the upper chap bent a little downwards, where it is joined to the head; and a certain callous substance encompassing its base as in parrots. It is of two colours; ash-coloured near the base, and red towards the point. It has three furrows or groves impressed in it; one in the livid part, two in the red. The eyes are fenced with a protuberant skin, of a livid colour; and they are gray or ash-coloured. These are marks sufficient to distinguish this bird by; but its value to those in whose vicinity it breeds, renders it still more an object of curiosity.

The puffin, like all the rest of this kind, has its legs thrown so far back, that it can hardly move without tumbling.—This makes it rise with difficulty, and subject to many falls before it gets upon the wing: but as it is a small bird, not much bigger than a pigeon, when it once rises, it can continue its flight with great celerity.

Both this and all the former build no nest; but lay their eggs either in the crevices of rocks, or in holes under ground near the shore. They chiefly choose the latter situation; for the puffin, the auk, the

Albatros, p. 195.



Sanderling, p. 182.

Stormy Petrel, p. 201.

To face p. 210 vol. iii.

guillemot, and the rest, cannot easily rise to the nest when in a lofty situation. Many are the attempts these birds are seen to make to fly up to those nests which are so high above the surface. In rendering them inaccessible to mankind, they often render them almost inaccessible to themselves. They are frequently obliged to make three or four efforts, before they can come at the place of incubation. For this reason, the auk and guillemot, when they have once laid their single egg, which is extremely large for the size, seldom forsake it until it is excluded. The male, who is better furnished for flight, feeds the female during this interval; and so bare is the place where she sits, that the egg would often roll down from the rock, did not the body of the bird support it.

But the puffin seldom chooses these inaccessible and troublesome heights for its situation. Relying on its courage, and the strength of its bill, with which it bites most terribly, it either makes or finds a hole in the ground, where to lay and bring forth its young. All the winter these birds, like the rest, are absent; visiting regions too remote for discovery. At the latter end of March, or the beginning of April, come over a troop of their spies or harbingers, that stay two or hree days, as it were to view and search out for their former situations, and see whether all be well. This done, they once more depart; and about the beginning of May, return again with the whole army of their companions. But if the season happens to be stormy and tempestuous, and the sea troubled, the unfortunate voyagers undergo incredible hardships; and they are found by hundreds, cast away upon he shores, lean and perished with famine.* It is most probable, herefore, that this voyage is performed more on the water than in he air; and as they cannot fish in stormy weather, their strength is exhausted before they can arrive at their wished-for harbour.

The puffin, when it prepares for breeding, which always happens a few days after its arrival, begins to scrape up a hole in the ground not far from the shore, and when it has some way penetrated the earth, it then throws itself upon its back, and with bill and claws thus burrows inward, till it has dug a hole with several windings and turnings, from eight to ten feet deep. It particularly seeks to dig under a stone, where it expects the greatest security. In this fortified retreat it lays one egg; which, though the bird be not much bigger than a pigeon, is of the size of that of a hen.

When the young one is excluded, the parent's industry and courage is incredible. Few birds or beasts will venture to attack them in their retreats. When the great sea-raven, as Jacobson informs us, comes to take away their young, the puffins boldly oppose him. Their meeting affords a most singular combat. As soon as the raven approaches, the puffin catches him under the throat with its beak, and sticks its claws into his breast, which makes the raven, with a loud screaming, attempt to get away; but the little bird still holds fast to the invader, nor lets him go till they both come to the sea, where they drop down together, and the raven is drowned; yet the raven is but too often successful; and invading the puffin at the bottom of its hole, devours both the parent and its family.

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* Willoughby's Ornith. p. 326

But were a punishment to be inflicted for immorality in irrational animals, the puffin is justly a sufferer from invasion, as it is often itself one of the most terrible invaders. Near the Isle of Anglesea, in an islet called *Priestholm*, their flocks may be compared, for multitude, to swarms of bees. In another islet, called *the Calf of Man*, a bird of this kind, but of a different species, is seen in great abundance. In both places, numbers of rabbits are found to breed; but the puffin, unwilling to be at the trouble of making a hole, when there is one ready made, dispossesses the rabbits, and it is not unlikely destroys their young. It is in these unjustly acquired retreats that the young puffins are found in great numbers, and become a very valuable acquisition to the natives of the place. The old ones (I am now speaking of the Manks puffin) early in the morning, at break of day, leave their nests and young, and even the island, nor do they return till night-fall. All this time they are diligently employed in fishing for their young; so that their retreats on land, which in the morning were loud and clamorous, are now still and quiet, with not a wing stirring till the approach of dusk, when their screams once more announce their return. Whatever fish, or other food, they have procured in the day, by night begins to suffer a kind of half digestion; and is reduced to an oily matter, which is ejected from the stomach of the old ones into the mouth of the young. By this they are nourished, and become fat to an amazing degree. When they are arrived to their full growth, they who are intrusted by the lord of the island, draw them from their holes; and, that they may more readily keep an account of the number they take, cut off one foot as a token. Their flesh is said to be excessively rank, as they feed upon fish, especially sprats and sea weed; however, when they are pickled and preserved with spices, they are admired by those who are fond of high eating. We are told, that formerly their flesh was allowed by the church on Lenten days They were, at that time, also taken by ferrets, as we do rabbits. At present, they are either dug out, or drawn out, from their burrows, with a hooked stick. They bite extremely hard, and keep such fast hold of whatever they seize upon, as not to be easily disengaged. Their noise, when taken, is very disagreeable, being like the efforts of a dumb person attempting to speak.

The constant depredation which these birds annually suffer, does not in the least seem to intimidate them, or drive them away; on the contrary, as the people say, the nest must be robbed, or the old ones will breed there no longer. All birds of this kind lay but one egg; yet if that be taken away, they will lay another, and so on to a third; which seems to imply, that robbing their nests does not much intimidate them from laying again. Those, however, whose nests have been thus destroyed, are often too late in bringing up their young; who, if they be not fledged and prepared for migration when all the rest depart, are left at land to shift for themselves. In August the whole tribe is seen to take leave of their summer residence; nor are they observed any more till the return of the ensuing spring It is probable that they sail away to more southern regions, as our mariners frequently see myriads of water-fowl upon their return, and steering usually to the north. Indeed the coldest countries seem to be their most favoured retreats; and the number of water-fowl is much greater in those colder climates, than in the warmer regions near the line. The quantity of oil which abound in their bodies, serves as a defence against cold, and preserves them in vigour against its severity; but the same provision of oil is rather detrimental in warm countries, as it turns rancid, and many of them die of disorders which arise from its putrefaction. In general, however, water-fowl can be properly said to be of no climate; the element upon which they live, being their proper residence. They necessarily spend a few months of summer upon land, to bring up their young; but the rest of their time is probably consumed in their migrations, or near some unknown coasts, where their provision of fish is found in the greatest abundance.

Before I go to the third general division of water-fowls, it may not be improper to observe, that there is one species of round-billed water-fowl, that does not properly lie within any of the former distributions This is the Gooseander; a bird with the body and wing shaped like those of the penguin kind, but with legs not hid in the belly. It may be distinguished from all others by its bill, which is round, hooked at the point, and toothed, both upper and under chap, like a saw. Its colours are various and beautiful: however, its manners and appetites entirely resemble those of the diver. It feeds upon fish, for which it dives; and is said to build its nest upon trees, like the heron and the cormorant. It seems to form the shade between the penguin and the goose kinds; having a round bill like the one, and unembarrassed legs, like the other. In the shape of the head, neck, and body, it resembles them both.

CHAPTER IX.

OF BIRDS OF THE GOOSE KIND, PROPERLY SO CALLED.

THE Swan, the Goose, and the Duck, are leaders of a numerous, useful, and beautiful tribe of birds, that we have reclaimed from a state of nature, and have taught to live in dependence about us. To describe any of these would be as superfluous as definitions usually are when given of things with which we are already well acquainted. There are few that have not had opportunities of seeing them, and whose ideas would not anticipate our description. But, though nothing be so easy as to distinguish these in general from each other, yet the largest of the duck kind approach the goose so nearly, that it may be proper to mark the distinctions.

The marks of the goose are, a bigger body, large wings, a longer neck, a white ring about the rump, a bill thicker at the base, slenderer towards the tip, with shorter legs, placed forward on the body. They both have a waddling walk; but the duck, from the position of its legs, has it in a greater degree. By these marks, these similar tribes may be known asunder; and though the duck should be found to equal the goose in size, which sometimes happens, yet there are still other sufficient distinctions.

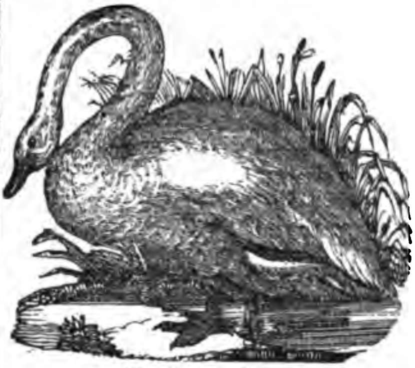
But they all agree in many particulars; and have a nearer affinity to each other than the neighbouring kinds in any other department. Their having been tamed, has produced alterations in each, by which they differ as much from the wild ones of their respective kinds, as they do among themselves. There is nearly as much difference beween the wild and the tame duck, as between some sorts of the duck and the goose; but still the characteristics of the kind are strongly marked and obvious; and this tribe can never be mistaken.

The bill is the first great obvious distinction of the goose kind from all of the feathered tribe. In other birds it is round and wedge-like, or crooked at the end. In all the goose kind it is flat and broad, made for the purpose of skimming ponds and lakes of the mantling weeds that stand on the surface. The bills of other birds are made of a horny substance throughout; these have their inoffensive bills sheathed with a skin which covers them all over. The bill of every other bird seems, in some measure, formed for piercing or tearing; theirs are only fitted for shovelling up their food, which is chiefly of the vegetable kind.

Though these birds do not reject animal food when offered them, yet they can contentedly subsist upon vegetables, and seldom seek any other. They are easily provided for; wherever there is water, there seems to be plenty. All the other web-footed tribes are continually voracious, continually preying. These lead more harmless lives: the weeds on the surface of the water, or the insects at the bottom, the grass by the bank, or the fruits and corn in cultivated grounds, are sufficient to satisfy their easy appetites: yet these, like every other animal, will not reject flesh, if properly prepared for them; it is sufficient praise to them that they do not eagerly pursue it.

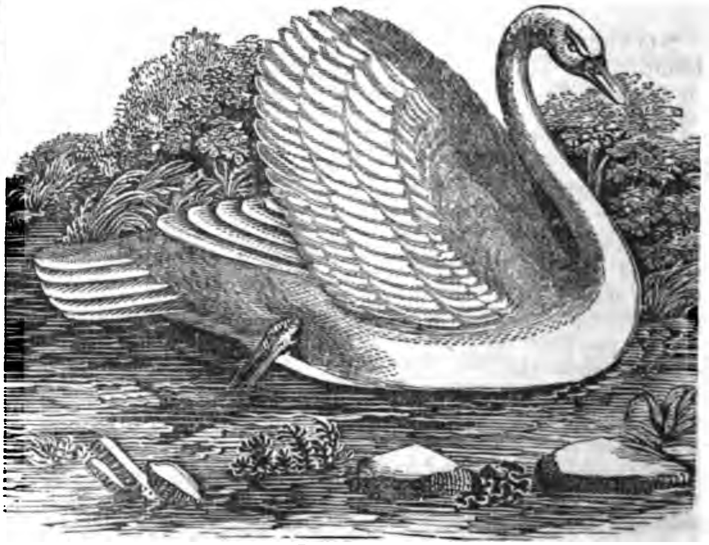
As their food is chiefly vegetables, so their fecundity is in proportion. We have had frequent opportunities to observe, that all the predatory tribes, whether of birds or quadrupeds, are barren and unfruitful. We have seen the lion with its two cubs; the eagle with the same number; and the penguin with even but one. Nature, that has supplied them with powers of destruction, has denied them fertility But it is otherwise with these harmless animals I am describing. They seem formed to fill up the chasms in Animated Nature, caused by the voraciousness of others. They breed in great abundance, and lead their young to the pool the instant they are excluded.

As their food is simple, so their flesh is nourishing and wholesome. The swan was considered as a high delicacy among the ancients; the goose was abstained from as totally indigestible. Modern manners have inverted tastes; the goose is now become the favourite; and the swan is seldom brought to table, unless for the purposes of ostentation. But at all times the flesh of the duck was in high esteem; the ancients thought even more highly of it than we do. We are contented to eat it as a delicacy; they also considered it as a medicine; and Plutarch assures us, that Cato kept his whole family in health, by feeding them with duck whenever they threatened to be out of order



Wild Swan, p. 215.

Cormorant, p. 197.



Tame Swan, p. 215.

To face p. 215 vol. ii

These qualities of great fecundity, easy sustenance, and wholesome nourishment, have been found so considerable, as to induce man to take these birds from a state of nature and render them domestic How long they have been thus dependents upon his pleasures is not known; for from the earliest accounts, they were considered as familiars about him. The time must have been very remote; for there have been many changes wrought in their colours, their figures, and even their internal parts, by human cultivation. The different kinds of these birds, in a wild state, are simple in their colourings: when one has seen a wild goose or a wild duck, a description of its plumage will, to a feather, exactly correspond with that of any other. But in the tame kinds no two of any species are exactly alike. Different in their size, their colours, and frequently in their general form, they seem the mere creatures of Art; and, having been so long dependent upon man for support, they seem to assume forms entirely suited to his pleasures or necessities.

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CHAPTER X.

OF THE SWAN, TAME AND WILD.

NO bird makes a more indifferent figure upon land, or a more beautiful one in the water, than the Swan. When it ascends from its favourite element, its motions are awkward, and its neck is stretched forward with an air of stupidity; but when it is seen smoothly sailing along the water, commanding a thousand graceful attitudes, moving at pleasure without the smallest effort; when it "proudly rows its state," as Milton has it, "with arched neck, between its white wings mantling," there is not a more beautiful figure in all Nature. In the exhibition of its form, there are no broken or harsh lines; no constrained or catching motions; but the roundest contours, and the easiest transitions; the eye wanders over every part with insatiable pleasure, and every part takes a new grace with a new motion.

This fine bird has long been rendered domestic; and it is now a doubt whether there be any of the tame kind in a state of nature. The wild swan, though so strongly resembling this in colour and form, is yet a different bird; for it is very differently formed within. The wild swan is less than the tame by almost a fourth; for as the one weighs twenty pounds, the other only weighs sixteen pounds and three quarters. The colour of the tame swan is all over white; that of the wild bird is along the back and the tips of the wings, of an ash-colour. But these are slight differences compared to what are found upon dissection. In the tame swan, the windpipe sinks down into the lungs in the ordinary manner; but in the wild, after a strange and wonderful contortion, like what we have seen in the crane, it enters through a hole formed in the breast-bone, and being reflected therein, returns by the same aperture; and being contracted into a narrow compass by a broad and bony cartilage, it is divided into two branches, which, before they enter the lungs, are dilated, and, as it were, swollen out into two cavities.

Such is the extraordinary difference between these two animals, which, externally, seem to be of one species. Whether it is in the power of long-continued captivity and domestication to produce this strange variety, between birds otherwise the same, I will not take upon me to determine. But certain it is, that our tame swan is nowhere to be found, at least in Europe, in a state of nature.

As it is not easy to account for this difference of conformation, so it is still more difficult to reconcile the accounts of the ancients with the experience of the moderns, concerning the vocal powers of this bird. The tame swan is one of the most silent of all birds; and the wild one has a note extremely loud and disagreeable. It is probable, the convolutions of the windpipe may contribute to increase the clangour of it; for such is the harshness of its voice, that the bird from thence has been called the *hooper*. In neither is there the smallest degree of melody; nor have they, for above this century, been said to give specimens of the smallest musical abilities; yet, notwithstanding this, it was the general opinion of antiquity, that the swan was a most melodious bird; and that even to its death, its voice went on improving. It would show no learning to produce what they have said upon the music of the swan: it has already been collected by Aldrovandus; and still more professedly by the Abbé Gedoyn, in the Transactions of the Academy of Belles Lettres. From these accounts it appears that, while Plato, Aristotle, and Diodorus Siculus, believed the vocality of the swan, Pliny and Virgil seem to doubt that received opinion. In this equipoise of authority, Aldrovandus seems to have determined in favour of the Greek philosophers; and the form of the windpipe in the wild swan, so much resembling a musical instrument inclined his belief still more strongly. In aid of this also, came the testimony of Pendasius, who affirmed, that he had often heard swans sweetly singing in the lake of Mantua, as he rowed up and down in a boat; as also of Olaus Wormius, who professed that many of his friends and scholars had heard them singing. "There was," says he, "in my family, a very honest young man, John Rostorph, a student in divinity, and a Norwegian by nation. This man did, upon his credit, and with the interposition of an oath, solemnly affirm, that once, in the territory of Dronten, as he was standing on the sea-shore, early in the morning, he heard an unusual and sweet murmur, composed of the most pleasant whistlings and sounds; he knew not at first whence they came, or how they were made, for he saw no man near to produce them; but, looking round about him, and climbing to the top of a certain promontory, he there espied an infinite number of swans gathered together in a bay, and making the most delightful harmony: a sweeter in all his lifetime he had never heard." These were accounts sufficient at least to keep opinion in suspense, though in contradiction to our own experience; but Aldrovandus, to put, as he supposed, the question past all doubt, gives us the testimony of a countryman of our own, from whom he had the relation. This honest man's name was Mr. George Braun, who assured him, that nothing was more common in England, than to hear swans sing; that they were bred in great numbers in the sea near London; and that every fleet of ships that returned from their voyages from distant countries, were met by swans, that came joyfully out to welcome their return, and salute them with a loud and cheerful singing! It was in this manner that Aldrovandus, that great and good man, was frequently imposed upon by the designing and the needy: his unbounded curiosity drew round him people of every kind, and his generosity was as ready to reward falsehood as truth.—Poor Aldrovandus! after having spent a vast fortune, for the purposes of enlightening mankind; after having collected more truth, and more falsehood, than any man ever did before him, he little thought of being reduced at last to want bread, to feel the ingratitude of his country, and to die a beggar in a public hospital!

Thus it appears that our modern authorities, in favour of the singing of swans, are rather suspicious, since they are reduced to this Mr. George Braun, and John Rostorph, the native of a country remarkable for ignorance and credulity. It is probable the ancients had some mythological meaning in ascribing melody to the swan; and as for the moderns, they scarce deserve our regard. The swan, therefore, must be content with that share of fame which it possesses on the score of its beauty; since the melody of its voice, without better testimony, will scarcely be admitted by even the credulous.

This beautiful bird is as delicate in its appetites, as elegant in its form. Its chief food is corn, bread, herbs growing in the water, and roots and seeds, which are found near the margin. It prepares a nest in some retired part of the bank, and chiefly where there is an islet in the stream. This is composed of water-plants, long grass and sticks; and the male and female assist in forming it with great assiduity. The swan lays seven or eight eggs, white, much larger than those of a goose, with a hard, and sometimes a tuberous shell. It sits near two months before its young are excluded; which are ash-coloured when they first leave the shell, and for some months after. It is not a little dangerous to approach the old ones, when their little family are feeding round them. Their fears, as well as their pride, seem to take the alarm; and they have sometimes been known to give a blow with their pinion, that has broke a man's leg or arm.

It is not till they are a twelvemonth old that the young swans change their colour with their plumage. All the stages of this bird's approach to maturity are slow, and seem to mark its longevity. It is two months hatching; a year in growing to its proper size: and if, according to Pliny's observation, that those animals that are longest in the womb are the longest lived, the swan is the longest in the shell of any bird we know, and is said to be remarkable for its longevity. Some say that it lives three hundred years; and Willoughby, who is in general diffident enough, seems to believe the report. A goose, as he justly observes, has been known to live a hundred; and the swan, from its superior size, and from its harder, firmer flesh, may naturally be supposed to live still longer.

Swans were formerly held in such great esteem in England, that by an act of Edward the Fourth, none, except the son of a king, was permitted to keep a swan, unless possessed of five marks a year By a subsequent act, the punishment for taking their eggs was imprisonment for a year and a day, and a fine at the king's will. At present they are but little valued for the delicacy of their flesh; but many are still preserved for their beauty. We see multitudes on the Thames and Trent; but nowhere greater numbers than on the salt water inlet of the sea near Abbotsbury, in Dorsetshire.

CHAPTER XI.

OF THE GOOSE AND ITS VARIETIES.

THE Goose, in its domestic state, exhibits a variety of colours. The wild goose always retains the same marks; the whole upper part is ash-coloured; the breast and belly are of a dirty white; the bill is narrow at the base, and at the tip it is black; the legs are of a saffron colour, and the claws black. These marks are seldom found in the tame, whose bill is entirely red, and whose legs are entirely brown. The wild goose is rather less than the tame; but both invariably retain a white ring round their tail, which shows that they are both descended from the same original.

The wild goose is supposed to breed in the northern parts of Europe; and, in the beginning of winter, to descend into more temperate regions. They are often seen flying at very great heights, in flocks from fifty to a hundred, and seldom resting by day. Their cry is frequently heard when they are at an imperceptible distance above us; and this seems bandied from one to the other, as among hounds in the pursuit. Whether this be the note of mutual encouragement or the necessary consequence of respiration, is doubtful; but they seldom exert it when they alight in these journeys.

Upon their coming to the ground by day, they range themselves in a line, like cranes; and seem rather to have descended for rest, than for other refreshment. When they have sat in this manner for an hour or two, I have heard one of them, with a loud long note, sound a kind of charge, to which the rest punctually attended, and they pursued their journey with renewed alacrity. Their flight is very regularly arranged: they either go in a line abreast, or in two lines, joining in an angle in the middle. I doubt whether the form of their flight be thus arranged to cut the air with greater ease, as is commonly believed; I am more apt to think it is to present a smaller mark to fowlers from below. A bullet might easily reach them, if huddled together in a flock, and the same discharge might destroy several at once; but, by their manner of flying, no shot from below can affect above one of them; and from the height at which they fly, this is not easy to be hit.

The Barnacle differs in some respects from both these; being less than either with a black bill, much shorter than either of the preceding. It is scarce necessary to combat the idle error of this bird's being bred from a shell sticking to ships' bottoms; it is well known to be hatched from an egg, in the ordinary manner, and to differ in very few particulars from all the rest of its kind.

The Brent Goose is still less than the former, and not bigger than a Muscovy duck, except that the body is longer. The head, neck, and upper part of the breast are black; about the middle of the neck, on each side, are two small spots or lines of white, which together appear like a ring.

These, and many other varieties, are found in this kind; which agree in one common character of feeding upon vegetables, and being remarkable for their fecundity. Of these, however, the tame goose is the most fruitful. Having less to fear from its enemies, leading a securer and a more plentiful life, its prolific powers increase in proportion to its ease; and though the wild goose seldom lays above eight eggs, the tame goose is often seen to lay above twenty. The female hatches her eggs with great assiduity; while the gander visits her twice or thrice a day, and sometimes drives her off to take her place, where he sits with great state and composure.

But beyond that of all animals is his pride when the young are excluded: he seems then to consider himself as a champion, not only obliged to defend his young, but also to keep off the suspicion of danger; he pursues dogs and men that never attempt to molest him: and, though the most harmless thing alive, is then the most petulant and provoking. When, in this manner, he has pursued the calf or the mastiff, to whose contempt alone he is indebted for safety, he returns to his female and her brood in triumph, clapping his wings, screaming, and showing all the marks of conscious superiority. It is probable, however, these arts succeed in raising his importance among the tribe where they are displayed; and it is probable there is not a more respectable animal on earth to a goose than a gander!

A young goose is generally reckoned very good eating; yet the feathers of this bird still farther increase its value. I feel my obligations to this animal every word I write; for, however deficient a man's head may be, his pen is nimble enough upon every occasion: it is happy indeed for us, that it requires no great effort to put it in motion, But the feathers of this bird are still as valuable in another capacity, as they make the softest and the warmest beds to sleep on.

Of goose-feathers, most of our beds in Europe are composed; in the countries bordering on the Levant, and in all Asia, the use of them is utterly unknown. They there use mattresses, stuffed with wool, or camel's hair, or cotton; and the warmth of their climates may perhaps make them dispense with cushions of a softer kind. But how it happens that the ancients had not the use of feather-beds, is to me surprising: Pliny tells us, indeed, that they made bolsters of feathers to lay their heads on; and this serves as a proof that they turned feathers to no other uses.

As feathers are a very valuable commodity, great numbers of geese are kept tame in the fens in Lincolnshire, which are plucked once or twice a year. These make a considerable article of commerce. The feathers of Somersetshire are most in esteem; those of Ireland are reckoned the worst. Hudson's Bay also furnishes very fine feathers supposed to be of the goose kind. The down of the swan is brought from Dantzic. The same place also sends us great quantities of the feathers of the cock and hen; but Greenland, Iceland, and Norway, furnish the best feathers of all: and in this number we may reckon the Eider-down, of which we shall take notice in this place. The best method of curing feathers, is to lay them in a room in an open exposure to the sun, and when dried, to put them into bags, and beat them well with poles to get the dust off. But after all, nothing will prevent, for a time, the heavy smell which arises from the putrefaction of the oil contained in every feather; no exposure will draw this off, now long soever it be continued; they must be laid upon, which is the only remedy: and for this reason, old feathers are much more valuable than new.

CHAPTER XII.

OF THE DUCK AND ITS VARIETIES.

THE Tame Duck is the most easily reared of all our domestic animals. The very instincts of the young ones direct them to their favourite element; and though they are conducted by a hen, yet they despise the admonitions of their leader.

This serves as an incontestible proof that all birds have their manners rather from Nature than education. A falcon pursues the partridge, not because it is taught by the old one, but because its appetites make their importunate call for animal food; the cuckoo follows a very different trade from that which its nurse endeavoured to teach it; and, if we may credit Pliny, in time destroys its instructer: animals of the duck kind also follow their appetites, not their tutor, and come to all their various perfections without any guide. All the arts possessed by man, are the result of accumulated experience; all the arts of inferior animals are self-taught, and scarce one acquired by imitation.

It is usual with the good women to lay duck eggs under a hen, because she hatches them better than the original parent would have done. The duck seems to be a heedless, inattentive mother; she frequently leaves her eggs till they spoil, and even seems to forget that she is intrusted with the charge: she is equally regardless of them when excluded; she leads them to the pond, and thinks she has sufficiently provided for her offspring when she has shown them the water. Whatever advantages may be procured by coming near the house, or attending the yard, she declines them all; and often lets the vermin, who haunt the waters, destroy them, rather than bring them to take shelter nearer home. The hen is a nurse of a very opposite character; she broods with the utmost assiduity, and generally brings forth a young one from every egg committed to her charge:

she does not lead her younglings to the water, indeed, but she watchfully guards them when there by standing at the brink. Should the rat, or the weasel, attempt to seize them, the hen can give them protection; she leads them to the house when tired with paddling, and rears up the supposititious brood, without ever suspecting that they belong to another.

The wild duck differs, in many respects, from the tame; and in them there is still greater variety than among the domestic kinds. Of the tame duck there are not less than ten different sorts; and of the wild, Brisson reckons above twenty. The most obvious distinction between wild and tame ducks is in the colour of their feet: those of the tame duck being yellow, those of the wild duck black. The difference between wild ducks among each other, arises as well from their size as the nature of the place they feed in. Sea-ducks, which feed in the salt-waters, and dive much, have a broad bill, bending upwards, a large hind-toe, and a long blunt tail. Pond-ducks, which feed in plashes, have a straight and narrow bill, a small hind-toe, and a sharp pointed train. The former are called, by our decoymen, *foreign ducks;* the latter are supposed to be natives of England. It would be tedious to enter into the minute varieties of such a number of birds; all agreeing in the same general figure, the same habits and mode of living, and differing in little more than their size and the colours of their plumage. In this tribe we may rank as natives of our own European dominions, the Eider Duck, which is double the size of a common duck, with a black bill; the Velvet Duck, not so large, and with a yellow bill; the Scoter, with a knob at the base of a yellow bill; the Tufted Duck, adorned with a thick crest; the Scaup Duck, less than the common duck, with the bill of a grayish blue colour; the Golden Eye, with a large white spot at the corners of the mouth, resembling an eye; the Sheldrake, with the bill of a bright red, and swelling into a knob; the Mallard, which is the stock from whence our tame breed has probably been produced; the Pintail, with the two middle feathers of the tail three inches longer than the rest; the Pochard, with the head and neck of a bright bay; the Widgeon, with a lead-coloured bill, and the plumage of the back marked with narrow black and white undulated lines, but best known by its whistling sound; lastly, the Teal, which is the smallest of this kind, with the bill black, the head and upper part of the neck of a bright bay. These are the most common birds of the duck kind among ourselves; but who can describe the amazing variety of this tribe, if he extends his views to the different quarters of the world? The most noted of the foreign tribe, are the Muscovy Duck, or, more properly speaking, the Musk Duck, so called from a supposed musky smell, with naked skin round the eyes, and which is a native of Africa; the Brasilian Duck, that is of the size of a goose, all over black except the tips of the wings. The American Wood Duck, with a variety of beautiful colours, and a plume of feathers that falls from the back of the head like a friar's cowl. These, and twenty others might be added, were increasing the number of names the way to enlarge the sphere of our comprehension.

All these live in the manner of our domestic ducks, keeping together in flocks in the winter, and flying in pairs in summer, bringing up their young by the water side, and leading them to their food as soon as out of the shell. Their nests are usually built among heath or rushes, not far from the water: and they lay twelve, fourteen, or more eggs, before they sit: yet this is not always their method; the dangers they continually encounter from their ground situation, sometimes obliges them to change their manner of building; and their awkward nests are often seen exalted on the tops of trees. This must be a very great labour to perform, as the duck's bill is but ill formed for building a nest, and giving the materials of which it is composed a sufficient stability to stand the weather. The nest, whether high or low, is generally composed of singular materials. The longest grass, mixed with heath, and lined with the bird's own feathers, usually go to the composition: however, in proportion as the climate is colder, the nest is more artificially made, and more warmly lined. In the Arctic regions, nothing can exceed the great care all of this kind take to protect their eggs from the intenseness of the weather. While the gull and the penguin kind seem to disregard the severest cold, the duck, in those regions, forms itself a hole to lay in, shelters the approach, lines it with a layer of long grass and clay; within that another of moss; and lastly, a warm coat of feathers, or down. The eider duck is particularly remarkable for the warmth of its nest. This bird, which, as was said, is about twice as large as the common duck, and resides in the colder climates, lays from six to eight eggs, making her nest among the rocks or the plants along the sea-shore. The external materials of the nests are such as are in common with the rest of the kind; but the inside lining, on which the eggs are immediately deposited, is at once the softest, warmest, and the lightest substance with which we are acquainted. This is no other than the inside down which covers the breast of the bird in the breeding season. This the female plucks off with her bill, and furnishes the inside of her nest with a tapestry more valuable than the most skilful artist can produce. The natives watch the place where she begins to build, and, suffering her to lay, take away both the eggs and the nest The duck, however, not discouraged by the first disappointment, builds and lays in the same place a second time; and this they in the same manner take away: the third time she builds, but the drake must supply the down from his breast to line the nest with; and if this be robbed, they both forsake the place, and breed there no more. This down the natives take care to separate from the dirt and moss with which it is mixed; and though no people stand in more need of a warm covering than themselves, yet their necessities compel them to sell it to the more indolent and luxurious inhabitants of the south for brandy and tobacco.

As they possess the faculties of flying and swimming, so they are in general birds of passage, and, it is most probable, perform their journeys across the ocean as well on the water as in the air. Those that migrate to this country, on the approach of winter, are seldom found so well tasted or so fat as fowls that continue with us the year round: their flesh is often lean, and still oftener fishy; which flavour it has probably contracted in the journey, as their food in the lakes of Lapland, from whence they descend, is generally of the insect kind.

As soon as they arrive among us, they are generally seen flying in flocks to make a survey of those lakes where they intend to take up their residence for the winter. In the choice of these they have two objects in view; to be near their food, and yet remote from interruption. Their chief aim is to choose some lake in the neighbourhood of a marsh, where there is at the same time a cover of woods, and where insects are found in greatest abundance. Lakes, therefore, with a marsh on one side, and a wood on the other, are seldom without vast quantities of wild-fowl; and where a couple are seen at any time, that is a sufficient inducement to bring hundreds of others. The ducks flying in the air, are often lured down from their heights by the loud voice of the mallard from below. Nature seems to have furnished this bird with very particular faculties for calling. The windpipe, where it begins to enter the lungs, opens into a kind of bony cavity, where the sound is reflected as in a musical instrument, that is heard a great way off. To this call all the stragglers resort; and in a week or a fortnight's time, a lake that before was quite naked, is black with water-fowl, that have left their Lapland retreats to keep company with our ducks who never stirred from home.

They generally choose that part of the lake where they are inaccessible to the approach of the fowler, in which they all appear huddled together, extremely busy and very loud. What it is can employ them all the day is not easy to guess. There is no food for them at the place where they sit and cabal thus, as they choose the middle of the lake; and as for courtship, the season for that is not yet come; so that it is wonderful what can so busily keep them occupied. Not one of them seems a moment at rest. Now pursuing one another, now screaming, then all up at once, then down again, the whole seems one strange scene of bustle, with nothing to do.

They frequently go off in a more private manner by night to feed in the adjacent meadows and ditches, which they dare not venture to approach by day. In these nocturnal adventures they are often taken; for, though a timorous bird, yet they are easily deceived, and every springe seems to succeed in taking them. But the greatest quantities are taken in decoys; which, though well known near London, are yet untried in the remoter parts of the country. The manner of making and managing a decoy is as follows:

A place is to be chosen for this purpose far remote from the common highway and all noise of people. A decoy is best where there is a large pond surrounded by a wood, and beyond that a marshy and uncultivated country. When the place is chosen, the pool, if possible, is to be planted round with willows, unless a wood answers the purpose of shading it on every side. On the south and north side of this pool are two, three, or four ditches or channels, made broad towards the pool, and growing narrower till they end in a point. These channels are to be covered over with nets, supported by hooped sticks bending from one side to the other; so that they form a vault or arch growing narrower and narrower to the point, where it is terminated by a tunnel-net, like that in which fish are caught in weirs. Along the banks of these channels so netted over, which are called pipes many hedges are made of reeds slanting to the edge of the channel the acute angles to the side next the pool. The whole apparatus also, is to be hidden from the pool by a hedge of reeds along the margin, behind which the fowler manages his operations. The place being fitted in this manner, the fowler is to provide himself with a number of wild ducks made tame, which are called decoys.—These are always to be fed at the mouth or entrance of the pipe, and to be accustomed to come at a whistle.

As soon as the evening is set in, *the decoy rises*, as they term it, and the wild fowl feed during the night. If the evening be still, the noise of their wings during their flight, is heard at a very great distance, and produces no unpleasing sensation. The fowler, when he finds a fit opportunity, and sees his decoy covered with fowl, walks about the pool, and observes into what pipe the birds gathered in the pool may be enticed or driven. Then casting hemp-seed, or some such seed as will float on the surface of the water, at the entrance, and up along the pipe, he whistles to his decoy-ducks, who instantly obey the summons, and come to the entrance of the pipe, in hopes of being fed as usual. Thither also they are followed by a whole flock of wild ones, who little suspect the danger preparing against them. Their sense of smelling, however, is very exquisite; and they would soon discover their enemy, but that the fowler always keeps a piece of turf burning at his nose, against which he breathes, and this prevents the effluvia of his person from reaching their exquisite senses. The wild ducks, therefore, pursuing the decoy-ducks, are led into the broad mouth of the channel or pipe, nor have the least suspicion of the man, who keeps hidden behind one of the hedges. When they have got up the pipe, however, finding it grow more and more narrow, they begin to suspect danger, and would return back; but they are now prevented by the man, who shows himself at the broad end below Thither, therefore, they dare not return; and rise they may not, as they are kept by the net above from ascending. The only way left them, therefore, is the narrow funnelled net at the bottom; into this they fly, and there they are taken.

It often happens, however, that the wild-fowl are in such a state of sleepiness or dozing, that they will not follow the decoy-ducks. Use is then generally made of a dog, who is taught his lesson. He passes backward and forward between the reed-hedges, in which there are little holes, both for the decoy man to see, and for the little dog to pass through. This attracts the eye of the wild-fowl; who, prompted by curiosity, advance towards this little animal, while he all the time keeps playing among the reeds, nearer and nearer the funnel, till they follow him too far to recede. Sometimes the dog will not attract their attention till a red handkerchief, or something very singular, be put about him. The decoy-ducks never enter the funnel-net with the rest, being taught to dive under water as soon as the rest are driven in.

The general season for catching fowl in decoys is from the latter end of October till February. The taking them earlier is prohibited by an act of George the Second, which imposes a penalty of five shillings for every bird destroyed at any other season.

The Lincolnshire decoys are commonly let at a certain annual rent, from five pounds to twenty pounds a year; and some even amount to thirty. These principally contribute to supply the markets of London with wild fowl. The number of ducks, widgeon, and teal, that are sent thither is amazing. About thirty thousand have been sent up in one season from ten decoys in the neighbourhood of Wainfleet. This quantity makes them so cheap on the spot, that it is asserted, the several decoy-men would be glad to contract for years to deliver their ducks at the next town for tenpence the couple.

To this manner of taking the wild-fowl in England, I will subjoin another still more extraordinary, frequently practised in China. Whenever the fowler sees a number of ducks settled in any particular plash of water, he sends off two or three gourds to float among them. These gourds resemble our pompions; but being made hollow, they swim on the surface of the water; and on one pool there may sometimes be seen twenty or thirty of these gourds floating together. The fowl at first are a little shy of coming near them; but by degrees they come nearer; and as all birds at last grow familiar with a scare-crow, the ducks gather about these, and amuse themselves by whetting their bills against them. When the birds are as familiar with the gourds as the fowler could wish, he then prepares to deceive them in good earnest. He hollows out one of those gourds large enough to put his head in; and, making holes to breathe and see through, he claps it on his head. Thus accoutred, he wades slowly into the water, keeping his body under, and nothing but his head in the gourd above the surface; and in that manner moves imperceptibly towards the fowls, who suspect no danger. At last, however, he fairly gets in among them; while they, having been long used to see gourds, take not the least fright while the enemy is in the very midst of them; and an insidious enemy he is; for ever as he approaches a fowl, he seizes it by the legs, and draws it in a jerk under water. There he fastens it under his girdle, and goes to the next, till he has thus loaded himself with as many as he can carry away. When he has got his quantity, without ever attempting to disturb the rest of the fowls on the pool, he slowly moves off again; and in this manner pays the flock three or four visits in a day. Of all the various artifices for catching fowl, this seems likely to be attended with the greatest success, as it is the most practised in China.

CHAPTER XIII.

OF THE KING-FISHER.

I WILL conclude this history of birds with one that seems to unite in itself somewhat of every class preceding. It seems at once possessed of appetites for prey like the rapacious kinds, with an attachment to water like the birds of that element. It exhibits in its form the beautiful plumage of the peacock, the shadings of the humming-bird, the bill of the crane, and the short legs of the swallow

The bird I mean is the King-fisher, of which many extraordinary falsehoods have been propagated; and yet of which many extraordinary things remain to be said that are actually true.

The King-fisher is not much larger than a swallow; its shape is clumsy; the legs disproportionably small, and the bill disproportionably long; it is two inches from the base to the tip; the upper chap black, and the lower yellow; but the colours of this bird atone for its inelegant form; the crown of the head and the coverts of the wings are of a deep blackish gray, spotted with bright azure; the back and tail are of the most resplendent azure; the whole under-side of the body is orange-coloured; a broad mark of the same passes from the bill beyond the eyes; beyond that is a large white spot: the tail is short, and consists of twelve feathers of a rich deep blue; the feet are of a reddish yellow, and the three joints of the outmost toe adhere to the middle toe, while the inner toe adheres only by one.

From the diminutive size, the slender short legs, and the beautiful colours of this bird, no person would be led to suppose it one of the most rapacious little animals that skims the deep. Yet it is for ever on the wing, and feeds on fish, which it takes in surprising quantities when we consider its size and figure. It chiefly frequents the banks of rivers, and takes its prey after the manner of the osprey, balancing itself at a certain distance above the water for a considerable space, then darting into the deep, and seizing the fish with inevitable certainty. While it remains suspended in the air, in a bright day, the plumage exhibits a beautiful variety of the most dazzling and brilliant colours. It might have been this extraordinary beauty that has given rise to fable; for wherever there is any thing uncommon, fancy is always willing to increase the wonder.

Of this bird it has been said that she built her nest on the water, and thus in a few days hatched and produced her young. But not to be interrupted in this task, she was said to be possessed of a charm to allay the fury of the waves; and during this period the mariner might sail with the greatest security. The ancient poets are full of these fables; their historians are not exempt from them. Cicero has written a long poem in praise of the halcyon, of which there remains but two lines. Even the Emperor Gordian has written a poem on this subject, of which we have nothing remaining. These fables have been adopted each by one of the earliest fathers of the church. "Behold," says St. Ambrose, "the little bird, which in the midst of the winter lays her eggs on the sand by the shore. From that moment the winds are hushed; the sea becomes smooth; and the calm continues for fourteen days. This is the time she requires; seven days to hatch, and seven days to foster her young. Their Creator has taught these little animals to make their nest in the midst of the most stormy season, only to manifest his kindness by granting them a lasting calm. The seamen are not ignorant of this blessing; they call this interval of fair weather their *halcyon days;* and they are particularly careful to seize the opportunity, as then they need fear no interruption." This, and a hundred other instances might be given of the credulity of mankind with respect to this bird; they entered into speculations concerning the manner of her calming the deep, the formation of her nest, and her peculiar sagacity: at present we do not speculate, because we know, with respect to our king-fisher, that most of the facts are false. It may be alleged, indeed, with some show of reason, that the halcyon of the ancients was a different bird from our king-fisher; it may be urged that many birds, especially on the Indian ocean, build a floating nest upon the sea; but still the history of the ancient halcyon is clogged with endless fable; and it is but an indifferent method to vindicate falsehood, by showing that a part of the story is true.

The king-fisher with which we are acquainted at present, has none of those powers of allaying the storm, or building upon the waves: it is contented to make its nest on the banks of rivers, in such situations as not to be affected by the rising of the stream. When it has found a place for its purpose, it hollows out with its bill a hole abou a yard deep; or if it finds the deserted hole of a rat, or one caused by the root of a tree decaying, it takes quiet possession. This hole it enlarges at the bottom to a good size; and, lining it with the down of the willow, lays its eggs there without any farther preparation.

Its nest, or rather hole, is very different from that described by the ancients, by whom it is said to be made in the shape of a long-necked gourd, of the bones of the sea-needle. The bones, indeed, are found there in great quanties, as well as the scales of fishes; but these are the remains of the bird's food, and by no means brought there for the purposes of warmth or convenience. The king-fisher, as Bellonius says, feeds upon fish, but is incapable of digesting the bones and scales, which he throws up again, as eagles and owls are seen to do a part of their prey. These fill the bird's nest of course; and, although they seem as if designedly placed there, are only a kind of nuisance.

In these holes, which, from the remains of fish brought there, are very fœtid, the king-fisher is often found with from five eggs to nine These the female continues to hatch even though disturbed; and though the nest be robbed, she will again return and lay there. "I have had one of those females brought me," says Reaumur, "which was taken from her nest about three leagues from my house. After admiring the beauty of her colours, I let her fly again, when the fond creature was instantly seen to return back to the nest where she had just before been made a captive. There, joining the male, she again began to lay, though it was for the third time, and though the season was very far advanced. At each time she had seven eggs. The older the nest is, the greater quantity of fish-bones and scales does it contain: these are disposed without any order; and sometimes take up a good deal of room."

The female begins to lay early in the season; and excludes her first brood about the beginning of April. The male, whose fidelity exceeds even that of the turtle, brings her large provisions of fish while she is thus employed; and she, contrary to most other birds, is found plump and fat at that season. The male, that used to twitter before this, now enters the nest as quietly and as privately as possible. The young ones are hatched at the expiration of twenty days; but are seen to differ as well in their size as in their beauty.

As the ancients have had their fables concerning this bird, so have the modern vulgar. It is an opinion generally received among them that the flesh of the king-fisher will not corrupt, and that it will even banish all vermin. This has no better foundation than that which is said of its always pointing, when hung up dead, with its breast to the north. The only truth which can be affirmed of this bird when killed is, that its flesh is utterly unfit to be eaten; while his beautiful plumage preserves its lustre longer than that of any other bird we know.

Having thus given a short history of birds, I own I cannot take leave of this most beautiful part of the creation without reluctance. These splendid inhabitants of air possess all those qualities that can sooth the heart, and cheer the fancy. The brightest colours, the roundest forms, the most active manners, and the sweetest music. In sending the imagination in pursuit of these, in following them to the chirping grove, the screaming precipice, or the glassy deep, the mind naturally lost the sense of its own situation, and, attentive to their little sports, almost forgot the TASK of describing them. Innocently to amuse the imagination in this dream of life is wisdom; and nothing is useless that, by furnishing mental employment, keeps us for a while in oblivion of those stronger appetites that lead to evil. But every rank and state of mankind may find something to imitate in those delightful songsters, and we may not only employ the time, but mend our lives by the contemplation. From their courage in defence of their young, and their assiduity in incubation, the coward may learn to be brave, and the rash to be patient. The inviolable attachment of some to their companions may give lessons of fidelity; and the connubial tenderness of others, be a monitor to the incontinent. Even those that are tyrants by nature never spread capricious destruction; and, unlike man, never inflict a pain but when urged by necessity.

PART IV.

OF FISHES.

BOOK I.

OF FISHES IN GENERAL.

CHAPTER I.

INTRODUCTION.

THE ocean is the great receptacle of fishes. It has been thought by some, that all fish are naturally of that salt element; and that they have mounted up into fresh water, by some accidental migration. A few still swim up rivers to deposit their spawn; but of the great body of fishes, of which the size is enormous and the shoals are endless, those all keep to the sea, and would quickly expire in fresh water. In that extensive and undiscovered abode, millions reside, whose manners are a secret to us, and whose very form is unknown. The curiosity of mankind, indeed, has drawn some from their depths, and his wants many more: with the figure of these at least he is acquainted; but for their pursuits, migrations, societies, antipathies, pleasures, times of gestation, and manner of bringing forth, these all are hidden in the turbulent element that protects them.

The number of fish to which we have given names, and of the figure, at least, of which we know something, according to Linnæus, are above four hundred. Thus to appearance, indeed, the history of fish is tolerably copious; but when we come to examine, it will be found that of the greatest part of these we know very little. Those qualities, singularities, or advantages, that render animals worth naming, still remain to be discovered. The history of fishes, therefore, has little in it entertaining: for our philosophers hitherto, instead of studying their nature, have been employed in increasing their catalogues; and the reader, instead of observations or facts, is presented with a long list of names that disgust him with their barren superflu ity. It must displease him to see the language of a science increasing, while the science itself has nothing to repay the increasing tax laid upon his memory.

Most fish offer us the same external form, sharp at either end, and swelling in the middle; by which they are enabled to traverse the fluid which they inhabit, with greater celerity and ease. That peculiar shape which Nature has granted to most fishes, we endeavour to imitate in such vessels as are designed to sail with the greatest swiftness; however, the progress of a machine moved forward in the water by human contrivance, is nothing to the rapidity of an animal destined by Nature to reside there. Any of the large fish overtake a ship in full sail with great ease, play round it without effort, and outstrip it at pleasure. Every part of the body seems exerted in this despatch; the fins, the tail, and the motion of the whole back-bone, assist progression; and it is to that flexibility of body at which art cannot arrive, that fishes owe their great velocity.

The chief instruments in a fish's motion, are the fins; which, in some fish, are much more numerous than in others. A fish completely fitted for sailing, is furnished with no less than two pair; also three single fins, two above and one below. Thus equipped, it migrates with the utmost rapidity, and takes voyages of a thousand leagues in a season. But it does not always happen that such fish as have the greatest number of fins have the swiftest motion: the shark is thought to be one of the swiftest swimmers, yet it wants the ventral or belly fins; the haddock does not move so swift, yet it is completely fitted for motion.

But the fins serve not only to assist the animal in progression, but in rising or sinking; in turning, or even leaping out of the water. To answer these purposes, the pectoral fins serve, like oars, to push the animal forward; they are placed at some little distance behind the opening of the gills; they are generally large and strong, and answer the same purposes to the fish in the water, as wings do to a bird in the air. With the help of these, and by their continued motion, the flying-fish is sometimes seen to rise out of the water, and to fly above a hundred yards; till, fatigued with its exertions, it is obliged to sink down again. These also serve to balance the fish's head, when it is too large for the body, and keep it from tumbling prone to the bottom, as is seen in large-headed fishes, when the pectoral fins are cut off. Next these are seen the ventral fins, placed towards the lower part of the body, under the belly; these are always seen to lie flat on the water, in whatever situation the fish may be; and they serve rather to depress the fish in its element, than to assist progressive motion. The dorsal fin is situated along the ridge of the back, and serves to keep it in equilibrio, as also to assist its progressive motion. In many fishes this is wanting; but in all flat fishes it is very large, as the pectoral fins are proportionably small. The anal fin occupies that part of the fish which lies between the anus and the tail; and this serves to keep the fish in its upright or vertical situation. Lastly the tail, which in some fishes is flat, and upright in others, seems the grand instrument of motion: the fins are but all subservient to it, and give direction to its great impetus, by which the fish seems to dart forward with so much velocity. To explain all this by experiment, a carp is taken, and put into a large vessel. The fish, in a state of repose, spreads all its fins, and seems to rest upon its pectoral and ventral fins near the bottom: if the fish folds up, (for it has the power of folding) either of its pectoral fins, it inclines to the same side; folding the right pectoral fin, the fish inclines to the right side; folding the left fin, it inclines to that side in turn. When the fish desires to have a retrograde motion, striking with the pectoral fins, in a contrary direction, effectually produces it. If the fish desires to turn, a blow from the tail sends it about; but if the tail strikes both ways, then the motion is progressive. In pursuance of these observations, if the dorsal and ventral fins be cut off, the fish reels to the right and left, and endeavours to supply its loss by keeping the rest of its fins in constant employment. If the right pectoral fin be cut off, the fish leans to that side; if the ventral fin on the same side be cut away, then it loses its equilibrium entirely. When the tail is cut off, the fish loses all motion, and gives itself up to where the water impels it.

From hence it appears that each of these instruments has a peculiar use assigned it; but, at the same time, that they all conspire to assist each other's motions. Some fish are possessed of all, whose motions are yet not the swiftest; others have but a part, and yet dart in the water with great rapidity. The number, the size, and the situation of the fins, therefore, seem rather calculated to correspond with the animal's figure, than solely to answer the purposes of promoting its speed. Where the head is large and heavy, there the pectoral fins are large, and placed forward, to keep it from oversetting. Where the head is small, or produced out into a long beak, and therefore not too heavy for the tail, the pectoral fins are small, and the ventral fins totally wanting.

As most animals that live upon land are furnished with a covering to keep off the injuries of the weather, so all that live in the water are covered with a slimy, glutinous matter, that, like a sheath, defends their bodies from the immediate contact of the surrounding fluid. This substance may be considered as a secretion from the pores of the animal's body, and serving not only to defend, but to assist the fish's easy progress through the water. Beneath this, in many kinds, is found a strong covering of scales, that, like a coat of mail, defend it still more powerfully; and under that, before we come to the muscular parts of the body, an oily substance, which supplies the requisite warmth and vigour.

The fish, thus protected and fitted for motion in its natural element, seems as well furnished with the means of happiness as quadrupeds or birds; but if we come to examine its faculties more nearly, we shall find it very much their inferior. The sense of touching, which beasts and birds have in a small degree, the fish, covered up in its own coat of mail, can have but little acquaintance with.

The sense of smelling, which in beasts is so exquisite, and among birds is not wholly unknown, seems given to fishes in a very moderate proportion. It is true, that all fishes have one or more nostrils; and even those that have not the holes perceptible without, yet have the proper formation of the bones for smelling within. But as air is the only medium we know for the distribution of odours, it cannot be supposed that these animals, residing in water, can be possessed of any power of being affected by them. If they have any perception of smells, it must be in the same manner as we distinguish by our taste: and it is probable the olfactory membrane in fish, serves them instead of a distinguishing palate: by this they judge of substances that, from tincturing the water with their vapours, are thus sent to the nostrils of the fish, and no doubt produce some kind of sensation. This most probably must be the use of that organ in those animals, as otherwise there would be the instruments of a sense provided for them, without any power in them of enjoyment

As to tasting, they seem to make very little distinction; the palate of most fish is hard and bony, and consequently incapable of the powers of relishing different substances. This sense among quadrupeds, who possess it in some degree, arises from the soft pliancy of the organ, and the delicacy of the skin which covers the instruments of tasting; it may be considered, in them, as a more perfect and delicate kind of feeling: in the bony palate of fish, therefore, all powers of distinguishing are utterly taken away; and we have accordingly often seen these voracious animals swallow the fisherman's plummet instead of the bait.

Hearing in fishes is found still more imperfect, if it be found at all. Certain it is, that anatomists have not been able to discover, except in the whale kind, the smallest traces of an organ, either within or without the head of fishes. It is true, that in the centre of the brain of some fishes are found now and then some little bones, the number and situation of which are entirely accidental. These bones, Mr. Klein has supposed to constitute the organ of hearing; but if we consider their entire dissimilitude to the bones that serve for hearing in other animals, we shall be of another opinion. The greatest number of fishes are deprived of these bones entirely: some fish have them in small numbers, and others in abundance; yet neither testify any excellence or defect in hearing. Indeed, of what advantage would this sense be to animals that are incapable of making themselves heard? they have no voice to communicate with each other, and consequently have no need of an organ for hearing. Mr. Gouan, who kept some gold fishes in a vase, informs us, that whatever noise he made, he could neither disturb nor terrify them; he halloed as loud as he could, putting a piece of paper between his mouth and the water, to prevent the vibrations from affecting the surface, and the fishes still seemed insensible: but when the paper was removed, and the sound had its full play upon the water, the fishes seemed instantly to feel the change, and shrunk to the bottom. From this we may learn, that fishes are as deaf as they are mute: and that when they seem to hear the call of a whistle or a bell at the edge of a pond, it is rather the vibrations of the sound that affect the water, by which they are excited, than any sounds that they hear.

Seeing seems to be the sense fishes are possessed of in the greatest degree; and yet even this seems obscure, if we compare it to that of other animals. The eye, in almost all fish, is covered with the same transparent skin that covers the rest of the head, and which probably serves to defend it in the water, as they are without eyelids. The globe is more depressed anteriorly, and is furnished behind with a muscle, which serves to lengthen or flatten it according to the necessities of the animal. The crystaline humour, which in quadrupeds is flat, and of the shape of a button-mould, in fishes is as round as a pea; or sometimes oblong, like an egg. From all this it appears that fish are extremely near-sighted; and that, even in the water, they can see objects at a very small distance. This distance might very easily be ascertained by comparing the refraction of bodies in the water, with that formed by a lens that is spherical. Those unskilled in mathematical calculations, will have a general idea of this, from the glasses used by near-sighted people. Those whose crystaline humour is too convex, or, in other words, too round, are always very near-sighted, and obliged to use concave glasses, to correct the imperfections of Nature. The crystaline humour of fish is so round, that it is not in the power of any glasses, much less of water, to correct their vision. This crystaline humour in fishes, all must have seen, being that little hard pea-like substance which is found in their eyes after boiling. In the natural state it is transparent, and not much harder than a jelly.

From all this, it appears how far fish fall behind terrestrial animals in their sensations, and consequently, in their enjoyments. Even their brain, which is by some supposed to be of a size with every animal's understanding, shows that fish are inferior even to birds in this particular. It is divided into three parts, surrounded with a whitish froth, and gives off nerves, as well to the senses of sight as of smelling. In some fish it is gray, in others white; in some it is flatted, in others round; but in all extremely small, compared to the bulk of the animal.

Thus Nature seems to have fitted these animals with appetites and powers of an inferior kind, and formed them for a sort of passive existence in the obscure and heavy element to which they are consigned. To preserve their own existence, and to continue it to their posterity, fill up the whole circle of their pursuits and enjoyments; to these they are impelled rather by necessity than choice, and seem mechanically excited to every fruition. Their senses are incapable of making any distinctions; but they drive forward in pursuit of whatever they can swallow, conquer, or enjoy.

A ceaseless desire of food seems to give the ruling impulse to all their motions. This appetite impels them to encounter every danger; and indeed their rapacity seems insatiable. Even when taken out of the water, and almost expiring, they greedily swallow the very bait by which they were allured to destruction.

The maw is, in general, placed next the mouth, and hough possessed of no sensible heat, is, however, endued with a surprising faculty of digestion. Its digestive power seems, in some measure, to increase with the quantity of food it is supplied with; a single pike having been known to devour a hundred roaches in three days. Its faculties also are as extraordinary; for it digests not only fish, but much harder substances; prawns, crabs, and lobsters, shells and all. These the cod or the sturgeon will not only devour, but dissolve down, though their shells are so much harder than the sides of the stomach which contains them. This amazing faculty in the cold maw of fishes, has justly excited the curiosity of philosophers, and has effectually overturned the system of those who supposed that the heat of the stomach was alone a sufficient instrument for digestion. The truth seems to be, and some experiments of the skilful Dr. Hunter seem to evince, that there is a power of animal assimilation lodged in the stomach of all creatures, which we can neither describe nor define, converting the substances they swallow into a fluid fitted for their own peculiar support. This is done neither by trituration, nor by warmth, nor by motion, nor by a dissolving fluid, nor by their united efforts, but by some principle in the stomach yet unknown, which acts in a different manner from all kinds of artificial maceration. The meat taken into the stomach or maw is often seen, though very near being digested, still to retain its original form, and ready for a total dissolution, while it appears to the eye as yet untouched by the force of the stomach. This animal power is lodged in the maw of fishes, in a greater degree than in any other creatures; their digestive powers are quick, and their appetites ever are craving.

Yet though fish are thus hungry, and for ever prowling, no animals can suffer the want of food for so long a time. The gold and silver fish we keep in vases, seem never to want any nourishment at all; whether it be that they feed on the water-insects, too minute for our observation, or that water alone is a sufficient supply, is not evident; but they are often seen for months without apparent sustenance. Even the pike, the most voracious of fishes, will live in a pond where there is none but himself; and, what is more extraordinary, will be often found to thrive there.

Still, however, fish are of all other animals the most voracious and insatiable. Whatever any of them is able to swallow, possessed of life, seems to be considered as the most desirable food. Some that have very small mouths feed upon worms and the spawn of other fish; others, whose mouths are larger, seek larger prey; it matters not of what kind, whether of another or their own. Those with the largest mouths pursue almost every thing that has life, and often meet each other in fierce opposition, when the fish with the largest swallow comes off with the victory, and devours its antagonist.

Thus are they irritated by the continual desire of satisfying their hunger; and the life of a fish, from the smallest to the greatest, is but one scene of hostility, violence, and evasion. But the smaller fry stand no chance in the unequal combat: and their usual way of escaping is by swimming into those shallows where the greater are unable, or too heavy to pursue. There they become invaders, in turn, and live upon the spawn of larger fish, which they find floating upon the surface of the water: yet there are dangers attending them in every place. Even in the shallows, the muscle, the oyster, and the scallop, lie in ambush at the bottom, with their shells open, and whatever little fish inadvertently approaches into contact, they at once close their shells upon him, and devour the imprisoned prey at their leisure.

Nor is the pursuit of fishes, like that of terrestrial animals, confined to a single region, or to one effort: shoals of one species follow those of another through vast tracts of ocean, from the vicinity of the pole, even down to the equator. Thus the cod, from the banks of Newfoundland, pursues the whiting, which flies before it even to the southern shores of Spain. The cachalot is said, in the same manner, to pursue a shoal of herrings, and to swallow thousands at a gulp.

This may be one cause of the annual migrations of fishes from one part of the ocean to the other; but there are other motives which come in aid of this also. Fishes may be induced to change the place of their residence, for one more suited to their constitutions, or more adapted to depositing their spawn. It is remarkable that no fish are fond of very cold waters, and generally frequent those places where it is warmest. Thus, in summer, they are seen in greatest numbers in the shallows near the shore, where the sun has power to warm the water to the bottom; on the contrary, in winter, they are found towards the bottom, in the deep sea; for the cold of the atmosphere is not sufficiently penetrating to reach them at those great depths. Cold produces the same effect upon fresh-water fishes; and when they are often seen dead after severe frosts, it is most probable that they have been killed by the severity of the cold, as well as by their being excluded by the ice from the air.

All fish live in the water; yet they all stand in need of air for their support. Those of the whale kind, indeed, breathe the air in the same manner as we do, and come to the surface every two or three minutes to take a fresh inspiration; but those which continue entirely under water, are yet under a necessity of being supplied with air, or they will expire in a very few minutes. We sometimes see all the fish of a pond killed, when the ice every where covers the surface of the water, and thus keeps off the air from the subjacent fluid. If a hole be made in the ice, the fish will be seen to come all to that part, in order to take the benefit of a fresh supply. Should a carp, in a large vase of water, be placed under an air-pump, and then be deprived of its air during the operation, a number of bubbles will be seen standing on the surface of the fish's body; soon after, the animal will appear to breathe swifter and with greater difficulty; it will be seen to rise towards the surface, to get more air; the bubbles on its surface begin to disappear; the belly, that was before swollen, will then fall of a sudden; and the animal sinks expiring and convulsed at the bottom.

So very necessary is air to all animals, but particularly to fish that, as was said, they can live but a few minutes without it; yet nothing is more difficult to be accounted for than the manner in which they obtain this necessary supply. Those who have seen a fish in water, must remember the motion of its lips and its gills, or at least of the bones on each side that cover them. This motion in the animal is, without doubt, analogous to our breathing; but it is not air, but water, that the fish actually sucks in and spouts out through the gills at every motion. The manner of its breathing is thus: the fish first takes a quantity of water by the mouth, which is driven to the gills; these close and keep the water so swallowed from returning by the mouth; while the bony covering of the gills prevents it from going through them, until the animal has drawn the proper quantity of air from the body of water thus imprisoned: then the bony covers open, and give it a free passage; by which means also the gills again are opened, and admit a fresh quantity of water. Should the fish be prevented from the free play of its gills, or should the bony covers be kept from moving, by a string tied round them, the animal would soon fall into convulsions, and die in a few minutes.

But though this be the general method of explaining respiration in fishes, the difficulty remains to know what is done with this air which the fish in this manner separates from the water. There seems no receptacle for containing it; the stomach being the chief cavity within the body, is too much filled with aliment for that purpose. There is indeed a cavity, and that a pretty large one, I mean the air-bladder or swim, which may serve to contain it for vital purposes; but that our philosophers have long destined to a very different use. The use universally assigned to the air-bladder, is the enabling the fish to rise or sink in the water at pleasure, as that is dilated or compressed. The use assigned by the ancients for it was to come in aid of the lungs, and to remain as a kind of storehouse of air to supply the animal in its necessities. I own my attachment to this last opinion; but let us exhibit both with their proper share of evidence, and the reader must be left to determine.

The air-bladder is described as a bag filled with air, sometimes composed of one, sometimes of two, and sometimes of three divisions, situated towards the back of the fish, and opening into the maw or the gullet. Those who contend that this bag is designed for raising or depressing the fish in the water, build upon the following experiment. A carp being put into the air-pump, and the air exhausted, the bladder is said to expand itself to such a degree, that the fish swells in an extraordinary manner, till the bladder bursts, and then the fish sinks, and ever after continues to crawl at the bottom. On another occasion, the air-bládder was pricked and wounded, which let out its air; upon which the fish sunk to the bottom, and was not seen to rise after. From hence it is inferred, that the use of the air-bladder must be by swelling, at the will of the animal, thus to increase the surface of the fish's body, and thence diminishing its specific gravity, to enable it to rise to the top of the water, and keep there at pleasure. On the contrary, when the fish wants to descend, it is, say they, but to exhaust this bladder of its air; and the fish being thus rendered slimmer and heavier, consequently sinks to the bottom.

Such is the account given of the use of the air-bladder; no part of which seems to me well supported. In the first place, though nothing is more certain, than that a carp put into the air-pump will swell, yet so will a mouse or a frog; and these we know to have no air-bladders. A carp will rise to the surface: but so will all fish that want air, whether they have an air-bladder or not. The air-bladder is said to burst in the experiment; but that I deny. The air-bladder is indeed found empty, but it has suffered no laceration, and may be distended by being blown into like any other bladder that is found. The fish, after the experiment, I grant, continues to creep at the bottom; and so will all fish that are sick and wounded, which must be the case with this after such an operation. Thus these facts prove nothing, but that when the fish is killed in an air-pump the air-bladder is found exhausted, and that it will naturally and necessarily be; for the drain of air by which the fish is supplied in the natural way will necessarily oblige it to make use of all its hidden stores; and, as there is a communication between the gullet and the air-bladder, the air which the water contains will thus be obviously drawn away. But still farther, how comes the air-bladder, according to their hypothesis, to swell under the experiment of the air-pump? What is it that closes the aperture of that organ in such a manner as at last to burst it? or what necessity has the fish for dilating it to that violent degree? At most, it only wants to rise to the surface; and that the fish can easily do without so great a distension of the air-bladder. Indeed, it should rather seem, that the more the air was wanted without, the less necessity there was for its being uselessly accumulated within; and to make the modern system consistent, the fish under the air-pump, instead of permitting its bladder to be burst, would readily give up its contents; which, upon their supposition, all can do at pleasure.

But the truth is, the fish can neither increase nor diminish the quantity of air in its air-bladder at will, no more than we can that which is contained in our stomachs. The animal has no one muscle, much less pair of muscles, for contracting or dilating this organ; its aperture is from the gullet; and what air is put into it must remain there till the necessities, and not the will, of the animal call it forth as a supply.

But, to put the matter past a doubt, many fish are furnished with an air-bladder that continually crawl at the bottom; such as the eel and the flounder; and many more are entirely without any bladder, that swim at ease in every depth; such as the anchovy and fresh-water gudgeon.* Indeed, the number of fish that want this organ is alone sufficient proof that it is not so necessary for the purposes of swimming; and as the ventral fins, which in all fish lie flat upon the water, seem fully sufficient to keep them at all depths, I see no great occasion for this internal philosophical apparatus for raising and depressing them. Upon the whole, the air-bladder seems adapted for different purposes than that of keeping the fish at different depths in the water; but whether it be to supply them with air when it is wanted from without, or for what other purpose, I will not take upon me to determine.

Hitherto we have seen a fish in every respect inferior to land animals; in the simplicity of their conformation, in their senses, and their enjoyments; but of that humble existence which they have been granted by nature, they have a longer term than any other class of Animated Nature. "Most of the disorders incident to mankind," says Bacon, "arise from the changes and alterations of the atmosphere; but fishes reside in an element little subject to change; theirs is an uniform existence; their movements are without effort, and their life without labour. Their bones also, which are united by cartilages admit of indefinite extension; and the different sizes of animals o the same kind, among fishes, is very various. They still keep growing their bodies, instead of suffering the rigidity of age, which is the cause of natural decay in land animals, still continue increasing with fresh supplies; and as the body grows, the conduits of life furnish their stores in greater abundance. How long a fish, that seems to have scarce any bounds put to its growth, continues to live, is not ascertained; perhaps the life of a man would not be long enough to measure that of the smallest."

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* Redi.

There have been two methods devised for determining the age of fishes, which are more ingenious than certain; the one is by the circles of the scales, the other by the transverse section of the back-bone. The first method is this. When a fish's scale is examined through a microscope, it will be found to consist of a number of circles, one circle within another, in some measure resembling those which appear upon the transverse section of a tree, and supposed to offer the same information. For as in trees we can tell their age by the number of their circles, so in fishes we can tell them by the number of their circles in every scale, reckoning one ring for every year of the animal's existence. By this method, Mr. Buffon found a carp, whose scales he examined, to be not less than a hundred years old; a thing almost incredible, had we not several accounts in other authors which tend to confirm the discovery. Gesner brings us an instance of one of the same age; and Albertus of one more than double that period.

The age of the skate and the ray, that want scales, may be known by the other method, which is, by separating the joints of the backbone, and then minutely observing the number of rings which the surface where it was joined exhibits. By this the fish's age is said to be known; and perhaps with as much certainty as in the former instance.

But how unsatisfactory soever these marks may be, we have no reason to doubt the great ages of some fishes. Those that have ponds, often know the oldest by their superior size. But the longevity of these animals is nothing when compared to their fecundity. All sorts, a few of the larger ones excepted, multiply their kind, some by hundreds, and some by millions. There are some that bring forth their young alive, and some that only produce eggs; the former are rather the least fruitful: yet even these are seen to produce in great abundance. The viviparous blenny, for instance, brings forth two or three hundred at a time, all alive and playing round the parent together. Those who exclude their progeny in a more imperfect state, and produce eggs, which they are obliged to leave to chance, either on the bottom, at the edge of the water, or floating on the surface where it is deeper, are all much more prolific, and seem to proportion their stock to the danger there is of its consumption. Of these eggs, thus deposited, scarce one in a hundred brings forth an animal; they are devoured by all the lesser fry that frequent the shores, by aquatic birds near the margin, and by the larger fish in deep water. Still, however, there are enough for supplying the deep with inhabitants; and, notwithstanding their own rapacity, and that of fowls of various tribes, the numbers that escape are sufficient to relieve the wants of a very considerable part of mankind. Indeed, when we consider the numbers that a single fish is capable of producing, the amount will seem astonishing. If, for instance, we should be told of a being so very prolific, that in a single season it could bring forth as many of its kind as there are inhabitants in England, it would strike us with surprise; yet a single cod produces full that number. The cod spawns in one season, as Lewenhoeck assures us, above nine millions of eggs or peas contained in one single roe. The flounder is commonly known to produce above one million; and the mackarel above five hundred thousand. Such an amazing increase, if permitted to come to maturity, would overstock Nature, and even the ocean itself would not be able to contain, much less to provide for, the half of its inhabitants. But two wise purposes are answered by this amazing increase; it preserves the species in the midst of numberless enemies, and serves to furnish the rest with a sustenance adapted to their nature.

Fishes seem, all except the whale kind, entirely divested of those parental solicitudes which so strongly mark the manners of the more perfect terrestrial animals. How far they copulate, remains as yet a doubt; for though they seem to join, yet the male is not furnished with any external instrument of generation. It is said by some, that his only end in that action is to emit his impregnating milt upon the eggs that at that time fall from the female. He is said to be seen pursuing them as they float down the stream, and carefully impregnating them one after another. On some occasions also the females dig holes in the bottom of rivers and ponds, and there deposit their spawn, which is there impregnated by the male in the same manner. All this, however, is very doubtful; what we know with certainty of the matter, and that not discovered till very lately, is, that the male has two organs of generation that open into the bladder of urine, and that these organs do not open into the rectum, as in birds, but have a particular aperture of their own.* These organs of generation in the male are empty at some seasons of the year; but before the time of spawning, they are turgid with what is called the milt, and emit the fluid proper for impregnation.

Fish have different seasons for depositing their spawn: some, that live in the depths of the ocean, are said to choose the winter months; but, in general, those with which we are acquainted, choose the hottest months in summer, and prefer such water as is somewhat tepified by the beams of the sun. They then leave the deepest parts of the ocean, which are the coldest, and shoal round the coasts, or swim up the fresh-water rivers, which are warm as they are comparatively shallow. When they have deposited their burdens, they then return to their old stations, and leave their nascent progeny to shift for themselves.

The spawn continues in its egg-state in some fish longer than in others, and this in proportion to the animal's size. In the salmon, for instance, the young animal continues in the egg from the beginning of December till the beginning of April; the carp continues in the egg not above three weeks; the little gold fish from China is produced still quicker. These all, when excluded, at first escape by their minuteness and agility. They rise, sink, and turn much readier than grown fish; and they can escape into very shallow waters when pursued. But, with all their advantages scarce one in a thousand survives the numerous perils of its youth. The very male and female that have given them birth, are equally dangerous and formidable with the rest, forgetting all relation at their departure.

Such is the general picture of these heedless and hungry creatures: but there are some in this class, living in the waters, that are possessed of finer organs and higher sensations; that have all the tenderness of birds or quadrupeds for their young; that nurse them with constan care, and protect them from every injury. Of this class are the *Cetaceous* tribe, or the fishes of the whale kind. There are others, though not capable of nursing their young, yet that bring them alive into the world, and defend them with courage and activity. These are the *Cartilaginous* kinds, or those who have gristles instead of bones. But the fierce unmindful tribe we have been describing, that leave their spawn without any protection, are called the *Spinous*, or bony kinds, from their bones resembling the sharpness of thorns.

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* Vide Gaman de Generatione Piscium.

Thus there are three grand divisions in the fish kind: the *cetaceous*, the *cartilaginous*, and the *spinous*, all differing from each other in their conformation, their appetites, in their bringing forth, and in the education of their young. These three great distinctions are not the capricious differences formed by a maker of systems, but are strongly and firmly marked in Nature. These are the distinctions of Aristotle; and they have been adopted by mankind ever since his time. It will be necessary, therefore, to give the history of each of these in particular; and then to range under each head, those fishes whose history is the most remarkable; or, more properly speaking, those of which we have any history. For we shall find, when we come to any of the species in particular, how little can be said of their habits, their stations, or method of propagation.

Much, indeed, can be said of them if considered relatively to man; and large books have been written of the manner of taking fish; or of dressing them. Apicius is noted for having first taught mankind to suffocate fish in Carthaginian pickle; and Quin, for giving a sauce to the John-dory: Mrs. Glass is famous for the eel pie, and Mr. Tull for his invention of spaying carp, to give it a finer flavour. In this manner our cooks handle the subject. On the other hand, our physicians assure us, that the flesh of fishes yield little nourishment, and soon corrupts; that it abounds in a gross sort of oil and water, and hath but a few volatile particles, which renders it less fit to be converted into the substance of our bodies. They are cold and moist, and must needs, say they, produce juices of the same kind, and consequently are improper to strengthen the body. In this diversity of opinion, it is the wisest way to eat our fish in the ordinary manner, and pay no great attention to cooks or doctors.

I cannot conclude this chapter without putting a question to the earned, which, I confess, I am not able to resolve. How comes it nat fish, which are bred in a salt element, have yet no salt to the aste, or that is capable of being extracted from them?

CHAPTER II.

OF CETACEOUS FISHES IN GENERAL.

AS on land there are some orders of animals that seem formed to command the rest, with greater powers and more various instincts, so in the ocean there are fishes which seem formed upon a nobler plan than others, and that, to their fishy form, join the appetites and the conformation of quadrupeds. These are all of the *cetaceous* kind; and so much raised above their fellows of the deep, in their appetites and instincts, that almost all our modern naturalists have fairly excluded them from the finny tribes, and will have them called, not fishes, but *great beasts of the ocean.* With them it would be as improper to say, men go to Greenland fishing for whale, as it would be to say that a sportsman goes to Blackwall fowling for mackarel.

Yet, notwithstanding philosophers, mankind will always have their own way of talking; and, for my own part, I think them here in the right. A different formation of the lungs, stomach, and intestines; a different manner of breathing or propagating, are not sufficient to counterbalance the great obvious analogy which these animals bear to the whole finny tribe. They are shaped as other fishes; they swim with fins; they are entirely naked, without hair; they live in the water, though they come up to breathe; they are only seen in the depths of the ocean, and never come upon shore but when forced thither. These, sure, are sufficient to plead in favour of the general denomination, and acquit mankind of error in ranking them with their lower companions of the deep.

But still they are as many degrees raised above other fishes in their nature, as they are in general in their size. This tribe is composed of the Whale and its varieties, of the Cachalot, the Dolphin, the Grampus, and the Porpoise. All these resemble quadrupeds in their internal structure, and in some of their appetites and affections. Like quadrupeds, they have lungs, a midriff, a stomach, intestines, liver, spleen, bladder, and parts of generation; their heart also resembles that of quadrupeds, with its partitions closed up as in them, and driving red and warm blood in circulation through the body. In short, every internal part bears a most striking similitude; and to keep these parts warm, the whole kind are also covered between the skin and the muscles with a thick coat of fat or blubber, which, like the bacon-fat of a hog, keeps out the cold, renders their muscles glib and pliant, and probably makes them lighter in swimming.

As these animals breathe the air, it is obvious that they cannot bear to be any long time under water. They are constrained, therefore, every two or three minutes, to come up to the surface to take breath, as well as to spout out through their nostril (for they have but one) that water which they sucked in while gaping for their prey This conduit, by which they breathe, and also throw out the water, is placed in the head, a little before the brain. Though externally the hole is but single, it is internally divided by a bony partition, which is closed by a sphincter muscle on the inside, that, like the mouth of a purse, shuts it up at the pleasure of the animal. There is also another muscle or valve, which prevents the water from going down the gullet. When, therefore, the animal takes in a certain quantity of water, which is necessary to be discharged and separated from its food, it shuts the mouth, closes the valve of the stomach, opens the sphincter that kept the nostril closed, and then breathing strongly from the lungs, pushes the water out by the effort, as we see it rise by the pressure of air in a fire-engine.

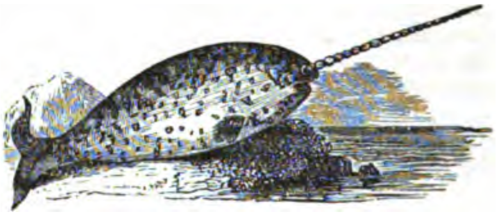
The senses of these animals seem also superior to those of other fishes. The eyes of other fishes, we have observed, are covered only with that transparent skin that covers the rest of the head; but in all the cetaceous kinds, it is covered by eyelids, as in man. This, no doubt, keeps that organ in a more perfect state, by giving it intervals of relaxation, in which all vision is suspended. The other fishes, that are for ever staring, must see, if for no other reason, more feebly, as their organs of sight are always exerted.

As for hearing, these also are furnished with the internal instruments of the ear, although the external orifice nowhere appears. It is most probable that this orifice may open by some canal, resembling the Eustachian tube, into the mouth; but this has not as yet been discovered.

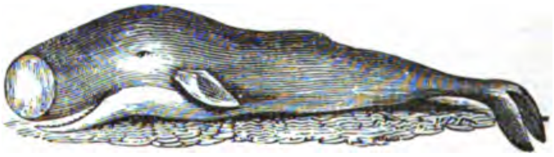
Yet Nature, sure, has not thus formed a complete apparatus for hearing, and denied the animal the use of it when formed. It is most likely that all animals of the cetaceous kind can hear, as they certainly utter sounds, and bellow to each other. This vocal power would be as needless to animals naturally deaf, as glasses to a man that was blind.

But it is in the circumstances in which they continue their kind, that these animals show an eminent superiority. Other fish deposit their spawn, and leave the success to accident: these never produce above one young, or two at the most; and this the female suckles entirely in the manner of quadrupeds, her breasts being placed, as in the human kind, above the navel. We have read many fabulous accounts of the nursing of the demigods of antiquity, of their feeding on the marrow of lions, and their being suckled by wolves; one might imagine a still more heroic system of nutrition, if we supposed that the young hero was suckled and grew strong upon the breast-milk of a she-whale!

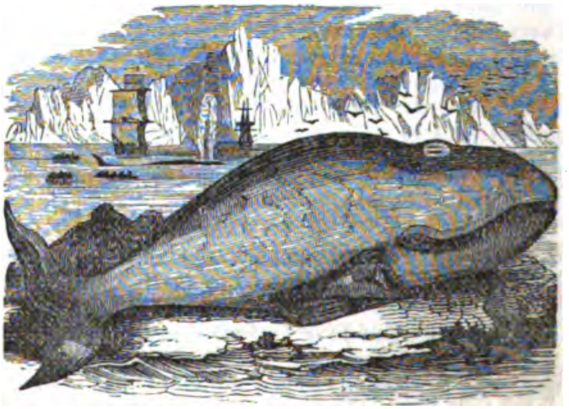
The whale or the grampus are terrible at any time; but are fierce and desperate in the defence of their young. In Waller's beautiful poem of the Summer Islands, we have a story, founded upon fact, which shows the maternal tenderness of these animals for their offspring. A whale and her cub had got into an arm of the sea, where, by the desertion of the tide, they were enclosed on every side. The people from shore soon saw their situation, and drove down upon them in boats, with such weapons as the urgent occasion offered. The two animals were soon wounded in several places, and the whole sea round was tinctured with their blood. The whales made several attempts to escape; and at last the old one, by its superior



Narwhal, or Sea Unicorn, p. 251.



Blunt-headed Cachalot, p. 253.



Common Whale, p. 243.

To face p. 243, vol. iii.

strength, forced over the shallow into the depths of the ocean. But though in safety herself, she could not bear the danger that awaited her young one; she therefore rushed in once more where the smaller animal was imprisoned, and resolved, when she could not protect, at least to share its danger. The story ends with poetical justice; for the tide coming in, brought off both in safety from their enemies, though not without sustaining an infinite number of wounds in every part.

As to the rest, the distinctive marks of this tribe are, that the number of their fins never exceeds three; namely, two pectoral fins, and one back fin; but in some sorts the last is wanting. These fins differ very much from those of other fishes, which are formed of straight spines: the fins of the cetaceous tribe are made up of bones and muscles; and the skeleton of one of their fins very much resembles the skeleton of a man's hand. Their tails also are different from those of all other fish: they are placed so as to lie flat on the surface of the water; while the other kinds have them, as we every day see, upright or edgewise. This flat position of the tail in cetaceous animals, enables them to force themselves suddenly to the surface of the water to breathe, which they are continually constrained to do.

Of these enormous animals, some are without teeth, and properly called whales; others have the teeth only in the lower jaw, and are called, by the French, cachalots: the narwhale has teeth only in the upper jaw; the dolphin's teeth, as well as those of the porpoise and grampus, are both above and below. These are the marks that serve to distinguish the kinds of this enormous tribe from each other; and these shall serve to guide us in giving their history.

CHAPTER III.

OF THE WHALE, PROPERLY SO CALLED, AND ITS VARIETIES.

IF we compare land animals, in respect to magnitude, with those of the deep, they will appear contemptible in the competition. It is probable indeed, that quadrupeds once existed much larger than we find them at present. From the skeletons of some that have been dug up at different times, it is evident that there must have been terrestrial animals twice as large as the elephant; but creatures of such an immense bulk required a proportionable extent of ground for subsistence; and, by being rivals with men for large territory, they must have been destroyed in the contest.

But it is not only upon land that man has exerted his power of destroying the larger tribes of Animated Nature: he has extended his efforts, even in the midst of the ocean, and has cut off numbers of these enormous animals that had, perhaps, existed for ages. We now no longer hear of whales two hundred, and two hundred and fifty feet long, which we are certain were often seen about two centuries ago. They have all been destroyed by the skill of mankind and the species is now dwindled into a race of diminutive animals, from thirty to about eighty feet long.

The northern seas were once the region to which the greatest of these animals resorted; but so great has been the slaughter of whales for more than two ages, that they begin to grow thinner every day; and those that are found there, seem, from their size, not come to their full dimensions. The greatest whales resort to places where they have the least disturbance; to those seas that are on the opposite side of the globe, near the south pole. In that part of the world, there are still to be seen whales that are above a hundred and sixty feet long; and perhaps even longer might be found in those latitudes near the south pole, to which we have not as yet ventured.

Taking the whale, however, at the ordinary size of eighty feet long and twenty feet high, what an enormous animated mass it must appear to the spectator! With what amazement must it strike him, to behold so great a creature gamboling in the deep, with the ease and agility of the smallest animal, and making its way with incredible swiftness! This is a sight which is very common to those who frequent the northern or southern ocean. Yet though this be wonderful, perhaps still greater wonders are concealed in the deep, which we have not had opportunities of exploring. These large animals are obliged to show themselves in order to take breath; but who knows the size of those that are fitted to remain for ever under water, and that have been increasing in magnitude for centuries! To believe all that has been said of the Sea-Serpent, or the Kraken, would be credulity; to reject the possibility of their existence, would be presumption.

The whale is the largest animal of which we have any certain information; and the various purposes to which, when taken, its different parts are converted, have brought us tolerably acquainted with its history. Of the whale, properly so called, there are no less than seven different kinds; all distinguished from each other by their external figure, or internal conformation. The Great Greenland Whale, without a back-fin, and black on the back; the Iceland Whale, without a back-fin, and whitish on the back; the New-England Whale, with a hump on the back; the Whale with six humps on the back; the Fin-fish, with a fin on the back near the tail; the Pike-headed Whale, and the Round-lipped Whale. All these differ from each other in figure, as their names obviously imply. They differ also in their manner of living; the fin-fish having a larger swallow than the rest, being more active, slender, and fierce, and living chiefly upon herrings. However, they are none of them very voracious; and, if compared to the cachalot, that enormous tyrant of the deep, they appear harmless and gentle. The history of the rest, therefore, may be comprised under that of the Great Common Greenland Whale, with which we are best acquainted.

The Great Greenland Whale is the fish, for taking which there are such preparations made in different parts of Europe. It is a large heavy animal, and the head alone makes a third of its bulk. It is usually found from sixty to seventy feet long. The fins on each side are from five to eight feet, composed of bones and muscles, and sufficiently strong to give the great mass of body which they move, speed and activity. The tail, which lies flat on the water, is above twenty-four feet broad; and, when the fish lies on one side, its blow is tremendous. The skin is smooth and black, and, in some places, marbled with white and yellow; which, running over the surface, has a very beautiful effect. This marbling is particularly observable in the fins and the tail. In the figures which are thus drawn by Nature, fancy often forms the pictures of trees, landscapes, and houses. In the tail of one that was thus marbled, Ray tells us, that the number 122 was figured very evenly and exact, as if done with a pencil.

The whale makes use only of the tail to advance itself forward in the water. This serves as a great oar to push its mass along; and it is surprising to see with what force an celerity its enormous bulk cuts through the ocean. The fins are only used for turning in the water, and giving a direction to the velocity impressed by the tail. The female also makes use of them, when pursued, to bear off her young, clapping them on her back, and supporting them by the fins on each side from falling.

The outward or scarf skin of the whale is no thicker than parchment; but this removed, the real skin appears, of about an inch thick, and covering the fat or blubber that lies beneath: this is from eight to twelve inches in thickness; and is, when the fish is in health, of a beautiful yellow. The muscles lie beneath; and these, like the flesh of quadrupeds, are very red and tough.

The cleft of the mouth is above twenty feet long, which is near one-third of the animal's whole length; and the upper jaw is furnished with barbs, that lie, like the pipes of an organ, the greatest in the middle, and the smallest to the sides. These compose the whalebone; the longest spars of which are found to be not less than eighteen feet; the shortest, being of no value, are thrown away. The tongue is almost immoveably fixed to the lower jaw, seeming one great lump of fat; and, in fact, it fills several hogsheads with blubber. The eyes are not larger than those of an ox; and when the crystaline humour is dried, it does not appear larger than a pea. They are placed towards the back of the head, being the most convenient situation for enabling them to see both before and behind; as also to see over them, where their food is principally found. They are guarded by eyelids and eyelashes, as in quadrupeds; and they seem to be very sharp-sighted.

Nor is their sense of hearing in less perfection: for they are warned at great distances, of any danger preparing against them. It would seem as if Nature had designedly given them these advantages, as they multiply little, in order to continue their kind. It is true, indeed, that the external organ of hearing is not perceptible, for this might only embarrass them in their natural element: but as soon as the thin scarf-skin above mentioned is removed, a black spot is discovered behind the eye, and under that is the auditory canal, that leads to a regular apparatus for hearing. In short, the animal hears the smallest sounds at very great distances, and at all times, except when it is spouting water; which is the time that the fishers approach o strike it.

These spout-holes or nostrils, in all the cetaceous tribe, have been already described; in this whale there are two, one on each side the head before the eyes, and crooked, somewhat like the holes on the belly of a violin. From these holes this animal blows the water very fiercely, and with such a noise that it roars like a hollow wind, and may be heard at three miles distance. When wounded it then blows more fiercely than ever, so that it sounds like the roaring of the sea in a great storm.

We have already observed, that the substance called whalebone, is taken from the upper jaw of the animal, and is very different from the real bones of the whale. The real bones are hard, like those of great land animals, are very porous, and filled with marrow. Two great strong bones sustain the under lip, lying against each other in the shape of a half-moon: some of these are twenty feet long; they are seen in several gardens set up against each other, and are usually mistaken for the ribs of this animal.

Such is the general conformation and figure of this great inhabitant of the deep, the precise anatomy of which has not been yet ascertained. In those places where they are caught in greatest abundance, the sailors are not very curious as to the structure of the viscera; and few anatomists care to undertake a task, where the operator, instead of separating with a lancet, must cut his way with an ax. It is as yet doubted, therefore, whether the male, that in most points internally resembles a quadruped, may not have one great bowel fitted entirely for the reception of air, to supply it, when constrained to keep longer than usual at the bottom. The sailors universally affirm that it has; and philosophers have nothing but the analogy of its parts to oppose to their general assertions.

As these animals resemble quadrupeds in conformation, so they bear a strong resemblance in some of their appetites and manners. The female joins with the male, as it is asserted, *more humano*, and once in two years feels the accesses of desire.

Their fidelity to each other exceeds whatever we are told of even the constancy of birds. Some fishers, as Anderson informs us, having struck one of two whales, a male and a female, that were in company together, the wounded fish made a long and a terrible resistance: it struck down a boat with three men in it, with a single blow of the tail, by which all went to the bottom. The other still attended its companion, and lent it every assistance; till, at last, the fish that was struck, sunk under the number of its wounds; while its faithful associate, disdaining to survive the loss, with great bellowing, stretched itself upon the dead fish, and shared its fate.

The whale goes with young nine or ten months, and is then fatter than usual, particularly when near the time of bringing forth. It is said that the embryo, when first perceptible, is about seventeen inches long, and white; but the cub, when excluded, is black, and about ten feet long. She generally produces one young one, and never above two. When she suckles her young, she throws herself on one side on the surface of the sea, and the young one attaches itself to the teat. The breasts are two, generally hid within the belly; but she can produce them at pleasure, so as to stand forward a foot and a half, or two feet; and the teats are like those of a cow. In some, the breasts are white; in others speckled; in all, filled with a large quantity of milk, resembling that of land animals.

Nothing can exceed the tenderness of the female for her offspring; she carries it with her wherever she goes, and when hardest pursued, keeps it supported between her fins. Even when wounded, she still clasps her young one; and when she plunges to avoid danger, takes it to the bottom; but rises sooner than usual, to give it breath again.

The young ones continue at the breast for a year; during which time, they are called by the sailors, *short heads*. They are then extremely fat, and yield above fifty barrels of blubber. The mother, at the same time, is equally lean and emaciated. At the age of two years they are called *stunts*, as they do not thrive much immediately after quitting the breast; they then scarce yield above twenty, or twenty-four, barrels of blubber: from that time forward, they are called *skull-fish*, and their age is wholly unknown.

Every species of whale propagates only with those of its own kind, and does not at all mingle with the rest; however, they are generally seen in shoals of different kinds together, and make their migrations in large companies, from one ocean to another. They are a gregarious animal, which implies their want of mutual defence against the invasions of smaller, but more powerful, fishes. It seems astonishing, therefore, how a shoal of these enormous animals find subsistence together, when it would seem that the supplying even one with food would require greater plenty than the ocean could furnish. To increase our wonder, we not only see them herding together, but usually find them fatter than any other animals of whatsoever element. We likewise know that they cannot swallow large fishes, as their throat is so narrow, that an animal larger than a herring could not enter. How then do they subsist and grow so fat?—A small insect, which is seen floating in those seas, and which Linnæus terms the Medusa, is sufficient for this supply. These insects are black, and of the size of a small bean, and are sometimes seen floating in clusters on the surface of the water. They are of a round form, like snails in a box, but they have wings, which are so tender, that it is scarce possible to touch them without breaking. These serve rather for swimming than flying; and the little animal is called by the Icelanders, the Walfischaos, which signifies the whale's provender. They have the taste of raw muscles, and have the smell of burnt sugar. These are the food of the whale, which it is seen to draw up in great numbers with its huge jaws, and to bruise between its barbs, which are always found with several of these sticking among them.

This is the simple food of the great Greenland whale; it pursues no other animal, leads an inoffensive life in its element, and is harmless in proportion to its strength to do mischief. There seems to be an analogy between its manners and those of the elephant. They are both the strongest and the largest animals in their respective elements; neither offer injury, but are terrible when provoked to resentment. The fin-fish, indeed, in some measure, differs from the great whale in this particular, as it subsists chiefly upon herrings, great shoals of which it is often seen driving before it. Yet even the swallow of this fish is not very large, if compared to the cachalot tribe; and its ravages are but sports in comparison. The stomach and intestines of al these animals, when opened, seldom have any thing in them except a soft unctuous substance of a brownish colour; and their excrements are of a shining red.

As the whale is an inoffensive animal, it is not to be wondered that it has many enemies, willing to take advantage of its disposition, and inaptitude for combat. There is a small animal, of the shell-fish kind, called the *Whale-louse*, that sticks to its body, as we see shells sticking to the foul bottom of a ship. This insinuates itself chiefly under the fins; and whatever efforts the great animal makes, it still keeps its hold, and lives upon the fat, which it is provided with instruments to arrive at.

The sword-fish, however, is the whale's most terrible enemy. "At the sight of this little animal," says Anderson, "the whale seems agitated in an extraordinary manner; leaping from the water as if with affright: wherever it appears, the whale perceives it at a distance, and flies from it in the opposite direction. I have been myself," continues he, "a spectator of their terrible encounter. The whale has no instrument of defence except the tail; with that it endeavours to strike the enemy; and a single blow taking place, would effectually destroy its adversary; but the sword-fish is as active as the other is strong, and easily avoids the stroke; then bounding into the air, it falls upon its great subjacent enemy, and endeavours not to pierce with its pointed beak, but to cut it with its toothed edges. The sea all about is soon dyed with blood, proceeding from the wounds of the whale: while the enormous animal vainly endeavours to reach its invader, and strikes with its tail against the surface of the water, making a report at each blow louder than the noise of a cannon."

There is still another and more powerful enemy called by the fishermen of New-England, *the Killer*. This is itself a cetaceous animal, armed with strong and powerful teeth. A number of these are said to surround the whale, in the same manner as dogs get round a bull. Some attack it with their teeth behind; others attempt it before; until, at last, the great animal is torn down, and its tongue is said to be the only part they devour when they have made it their prey. They are said to be of such great strength, that one of them alone was known to stop a dead whale that several boats were towing along, and drag it from among them to the bottom.

But of all the enemies of these enormous fishes, man is the greatest: he alone destroys more in a year than the rest in an age, and actually has thinned their numbers in that part of the world where they are chiefly sought. The great resort of these animals, was found to be on the inhospitable shores of Spitzbergen; where the distance of the voyage, the coldness of the climate, the terrors of the icy sea, and, still more, their own formidable bulk, might have been expected to protect them from human injury. But all these were but slight barriers against man's arts, his courage, and his necessities. The European ships, soon after the improvement of navigation, found the way into those seas; and as early as the beginning of the fourteenth century, the Biscayneers were in possession of a very considerable trade to the coasts of Greenland. The Dutch and the English followed them thither, and soon took that branch of commerce out of their hands. The English commenced the business about the beginning of the seventeenth century; and the town of Hull had the honour of first attempting that profitable branch of trade. But, at present, it seems upon the decline, as the quantity of fish are so greatly reduced, by the constant capture for such a vast length of time. It is now said, that the fishers, from a defect of whales, apply themselves to the seal-fishery; yet, as these animals are extremely timorous, they will soon be induced to quit those shores, where they meet such frequent disturbance and danger. The poor natives of Greenland themselves, who used to feed upon the whale, are diminishing, in proportion as their sustenance is removed; and, it is probable, that the revolution of a few years will see that extensive coast totally deserted by its inhabitants, as it is already nearly deserted by the whales.

The art of taking whales, like most others, is much improved by time, and differs in many respects from that practised by the Biscayneers, when they first frequented the icy sea. But as the description of their methods is the least complicated, and consequently the easiest understood, it will be best suited to our purpose.

For this navigation, the Biscayneers, in favourable seasons, fitted out thirty ships, of two hundred and fifty tons each, with fifty choice men apiece, and a few boys. These were stored with six months provision; and each ship had its boats, which were to be serviceable when come to the place of duty. When arrived at the part where the whales are expected to pass to the southward, they always keep their sails set, and a sailor is placed at the mast-head, to give information when he spies a whale. As soon as he discovers one, the whole crew are instantly in employment: they fit out their boats, and row away to where the whale was seen. The harpooner, who is to strike the fish, stands at the prow of the boat, with a harpoon or javelin in his hand, five or six feet long, pointed with steel like the barb of an arrow, of a triangular shape. As this person's place is that of the greatest dexterity, so also it is the greatest danger: the whale sometimes overturns the boat with a blow of its tail, and sometimes drives against it with fury.

In general, however, the animal seems to sleep on the surface of the water; while the boat is approaching, the harpooner stands aloft, and with his harpoon tied to a cord of several hundred fathoms length, darts it into the animal, and then rows as fast as possible away. It is some time before the whale seems to feel the blow; the instrument has usually pierced no deeper than the fat, and that being insensible, the animal continues for a while motionless; but soon roused from its seeming lethargy, as the shaft continues to pierce deeper and deeper into the muscular flesh, it flies off with amazing rapidity. In the mean time, the harpoon sticks in its side, while the rope, which is coiled up in the boat, and runs upon a swivel, lengthens as the whale recedes, but still shows the part of the deep to which it has retreated. The cord is coiled up with great care; for such is the rapidity with which it runs off, that if it was but the least checked, as it yields with the animal's retreat, it would infallibly overset the boat, and the crew would go to the bottom. It sometimes happens also, that the rapidity with which it runs over the swivel at the edge of the boat, heats it and it would infallibly take fire, did not a man stand continually with a wet mop in his hand to cool the swivel as the cord runs The whale having dived to a considerable depth, remains at the bottom sometimes for near half an hour, with the harpoon in its body, and then rises to take breath, expecting the danger over; but the instant it appears, they are all with their boats ready to receive it, and fling their harpoons into its body; the animal again dives and again rises, while they repeat their blows. The ship follows in full sail, like al. the rest, never losing sight of the boats, and ready to lend them assistance; the whole ocean seems died in blood. Thus they renew their attack, till the whale begins to be quite enfeebled and spent, when they plunge their long spears into various parts of its body, and the enormous animal expires. When it is dead, to prevent it from sinking, they tie it with a strong iron chain to the boat, and either cut it up in pieces, and carry it home in that manner, or extract the oil from the blubber on shipboard.

Such is the manner in which these fish were taken in the beginning; but succeeding arts have improved the method, and the harpoon is now thrown by a machine being used which inflicts a deeper wound, and strikes the animal with much greater certainty: there are better methods for extracting the oil, and proper machines for cutting the animal up, than were used in the early fisheries. But as an account of this belongs to the History of Arts, and not of Nature, we must be contented with observing, that several parts of this animal, and all but the intestines and the bones, are turned to very good account; not only the oil, but the greaves from which it is separated. The barbs also were an article of great profit; but have sunk in their price since women no longer use them to swell out their petticoats with whalebone. The flesh of this animal is also a dainty to some nations, and even the French seamen are now and then found to dress and use it as their ordinary diet at sea. It is said, by the English and Dutch sailors, to be hard and ill-tasted; but the French assert the contrary; and the savages of Greenland, as well as those near the south pole, are fond of it to distraction. They eat the flesh and drink the oil, which is a first-rate delicacy. The finding a dead whale is an adventure considered among the fortunate circumstances of their wretched lives. They make their abode beside it; and seldom remove till they have left nothing but the bones.

Jacobson, whom we quoted before in the History of Birds, where he described his countrymen of the island of Feroe as living a part of the year upon salted gulls, tells us also, that they are very fond of salted whale's flesh. The fat of the head they season with bay salt, and then hang it up to dry in the chimney. He thinks it tastes as well as fat bacon; and the lean, which they boil, is, in his opinion, not inferior to beef. I fancy poor Jacobson would make but an indifferent taster at one of our city feasts!

CHAPTER IV

OF THE NARWHALE.

FROM whales that entirely want teeth, we come to such as have them in the upper jaw only; and in this class there is found but one, the Narwhale, or Sea-unicorn. This fish is not so large as the whale, not being above sixty feet long. Its body is slenderer than that of the whale, and its fat not in so great abundance. But this great animal is sufficiently distinguished from all others of the deep by its tooth or teeth, which stand pointing directly forward from the upper jaw, and are from nine to fourteen feet long. In all the variety of weapons with which Nature has armed her various tribes, there is not one so large or so formidable as this. This terrible weapon is generally found single, and some are of opinion that the animal is furnished but with one by Nature; but there is at present the skull of a narwhale at the Stadthouse at Amsterdam, with two teeth; which plainly proves that in some animals, at least, this instrument is double. It is even a doubt whether it may not be so in all; and that the narwhale's wanting a tooth is only an accident which it has met with in the encounters it is obliged daily to be engaged in. Yet it must be owned of these that are taken only with one tooth, there seems no socket, nor no remains of any other upon the opposite side of the jaw, but all is plain and even. However this be, the tooth, or as some are pleased to call it, the horn of the narwhale, is the most terrible of all natural instruments of destruction. It is as straight as an arrow, about the thickness of the small of a man's leg, wreathed in the manner we sometimes see twisted bars of iron; it tapers to a sharp point; and is whiter, heavier, and harder than ivory. It is generally seen to spring from the left side of the head directly forward in a straight line with the body; and its root enters into the socket above a foot and a half. In a skull to be seen at Hamburgh there are two teeth, which are each above seven feet long, and are eight inches in circumference. When the animal, possessed of these formidable weapons, is urged to employ them, it drives directly forward against the enemy with its teeth, that, like protended spears, pierce whatever stands before them.

The extreme length of these instruments have induced some to consider them rather as horns than teeth; but they in every respect resemble the tusks of the boar and the elephant. They grow, as in them, from sockets in the upper jaw; they have the solidity of the hardest bone, and far surpass ivory in all its qualities. The same error has led others to suppose, that as among quadrupeds the female was often found without horns, so these instruments of defence were only to be found in the male, but this has been more than once refuted by actual experience; both sexes are found armed in this manner; the horn is sometimes found wreathed and sometimes smooth; sometimes a little bent and sometimes straight: but always strong deeply fixed, and sharply pointed.

Yet notwithstanding all these appointments for combat, these long and pointed tusks, amazing strength, and unmatchable celerity, the narwhale is one of the most harmless and peaceable inhabitants of the ocean. It is seen constantly and inoffensively sporting among the other great monsters of the deep, noway attempting to injure them, but pleased in their company. The Greenlanders call the narwhale the forerunner of the whale; for wherever it is seen, the whale is shortly after sure to follow. This may arise as well from the natural passion for society in these animals, as from both living upon the same food, which are the insects described in the preceding chapter. These powerful fishes make war upon no other living creatures; and, though furnished with instruments to spread general destruction, are as innocent and as peaceful as a drove of oxen. Nay, so regardless are they of their own weapons, and so utterly unmindful to keep them in repair for engagement, that they are constantly seen covered over with weeds, slough, and all the filth of the sea; they seem rather considered as an impediment than a defence.

The manners and appetites both of the narwhale and the great whale are entirely similar; they both alike want teeth for chewing, and are obliged to live upon insects; they both are peaceable and harmless, and always rather fly than seek the combat. The narwhale however, has a much narrower gape than the great whale, and, therefore, does not want the use of barbs to keep in its food when once sucked into the mouth. It is also much swifter, and would never be taken by the fishermen but for those very tusks which at first appear to be its principal defence. These animals, as was said, being fond of living together, are always seen in herds of several at a time; and whenever they are attacked, they crowd together in such a manner, that they are mutually embarrassed by their tusks. By these they are often locked together, and are prevented from sinking to the bottom. It seldom happens, therefore, but the fishermen make sure of one or two of the hindmost, which very well reward their trouble.

It is from the extraordinary circumstance of the teeth, therefore, that this fish demands a distinct history; and such has been the curiosity of mankind, and their desire to procure them, that a century ago they were considered as the greatest rarity in the world. At that time the art of catching whales was not known; and mankind saw few, except such as were stranded on the coasts by accident. The tooth of the narwhale, therefore, was ascribed to a very different animal from that which really bore it. Among other fossil substances they were sometimes dug up; and the narwhale being utterly unknown, naturalists soon found a terrestrial owner. They were thought to be the horns of unicorns, an animal described by Pliny as resembling a horse, and with one straight horn darting forward from the middle of its forehead. These teeth were, therefore, considered as a strong testimony in favour of that historian's veracity, and were shown among the most precious remains of antiquity. Even for some time after the narwhale was known, the deceit was continued, as those who were possessed of a tooth sold it to great advantage. But at present they are too well known to deceive any, and are only shown for what they really are; their curiosity increasing in proportion to their weight and their size

CHAPTER V.

OF THE CACHALOT AND ITS VARIETIES.

THE Cachalot, which has generally gone under the name of the spermaceti whale, till Mr. Pennant very properly made the distinction, by borrowing its name from the French, has several teeth in the under-jaw, but none in the upper. As there are no less than seven distinctions among whales, so also there are the same number of distinctions in the tribe we are describing. The cachalot with two fins and a black back; the cachalot with two fins and a whitish back; that with a spout in the neck; that with a spout in the snout; that with three fins and sharp-pointed teeth; that with three fins and sharp-edged teeth; and, lastly, the cachalot with three fins and flatted teeth.

This tribe is not of such enormous size as the whale, properly so called, not being above sixty feet long, and sixteen feet high. In consequence of their being more slender, they are much more active than the common whale; they remain a longer time at the bottom; and afford a smaller quantity of oil. As in the common whale the head was seen to make a third part of its bulk, so in this species the head is so large as to make one half of the whole. The tongue of this animal is small, but the throat is very formidable; and with very great ease it could swallow an ox. In the stomach of the whale scarce any thing is to be found; but in that of the cachalot there are loads of fish of different kinds; some whole, some half-digested, some small, and others eight or nine feet long. The cachalot is, therefore, as destructive among lesser fishes as the whale is harmless; and can at one gulp swallow a shoal of fishes down its enormous gullet. Linnæus tells us that this fish pursues and terrifies the dolphins and porpoises so much, as often to drive them on shore.

But, how formidable soever this fish may be to its fellows of the deep, it is by far the most valuable, and the most sought after by man, as it contains two very precious drugs, spermaceti and ambergris.—The use of these, either for the purposes of luxury or medicine, is so universal, that the capture of this animal, that alone supplies them, turns out to very great advantage, particularly since the art has been found out of converting all the oil of this animal, as well as the brain, into that substance called spermaceti.

This substance, as it is naturally formed, is found in the head of the animal, and is no other than the brain. The outward skin of the head being taken off, a covering of fat offers about three inches thick; and, under that, instead of a bony skull, the animal has only another thick skin that serves for a covering and defence for the brain. The first cavity, or chamber of the brain, is filled with that spermaceti which is supposed of the greatest purity and highest value. From this cavity there is generally drawn about seven barrels of the clearest spermaceti, that, thrown upon water, coagulates like cheese Below this there is another chamber, just over the gullet, which is about seven feet high; and this also contains the drug, but of less value. It is distributed in this cavity like honey in a hive, in small cells, separated from each other by a membrane like the inner skin of an egg. In proportion as the oily substance is drawn away from this part, it fills anew from every part of the body; and from this is generally obtained about nine barrels of oil. Besides this, the spinal marrow, which is about as thick as a man's thigh, and reaches all along the back-bone to the tail, where it is not thicker than one's finger, affords no inconsiderable quantity.

This substance, which is used in the composition of many medicines, rather to give them consistence than efficacy, was at first sold at a very high price, both from the many virtues ascribed to it, and the small quantity that the cachalot was capable of supplying; at present, the price is greatly fallen; first, because its efficacy in medicine is found to be very small; and again, because the whole oil of the fish is very easily convertible into spermaceti. This is performed by boiling it with the lea of pot-ash, and hardening it in the manner of soap. Candles are now made of it, which are substituted for wax and sold much cheaper; so that we need not fear having our sperma ceti adulterated in the manner some medical books caution us to beware of; for they carefully guard us against having our spermacet adulterated with virgin wax.

As to the ambergris, which is sometimes found in this whale, it was long considered as a substance found floating on the surface of the sea; but time, that reveals the secrets of the mercenary, has discovered that it chiefly belongs to this animal. The name, which has been improperly given to the former substance, seems more justly to belong to this; for the ambergris is found in the place where the seminal vessels are usually situated in other animals. It is found in a bag of three or four feet long, in round lumps from one to twenty pounds weight, floating in a fluid rather thinner than oil, and of a yellowish colour. There are never seen more than four at a time in one of these bags; and that which weighed twenty pounds, and which was the largest ever seen, was found single. These balls of amber gris are not found in all fishes of this kind, but chiefly in the oldest and strongest. The uses of this medicine for the purposes of luxury and as a perfume, are well known; though upon some subjects ignorance is preferable to information.

Dolphin, p. 255.

Grampus, p. 255.

Porpoise, p. 255.

To face p. 255 vol. iii.

CHAPTER VI.

OF THE DOLPHIN, THE GRAMPUS, AND THE PORPOISE, WITH THEIR VARIETIES.

ALL these fish have teeth both in the upper and the lower jaw, and are much less than the whale. The Grampus, which is the largest, never exceeds twenty feet. It may also be distinguished by the flatness of its head, which resembles a boat turned upside down. The Porpoise resembles the grampus in most things except the snout, which is not above eight feet long; its snout also more resembles that of a hog. The Dolphin has a strong resemblance to the porpoise, except that its snout is longer and more pointed. They have all fins on the back; they all have heads very large, like the rest of the whale kind; and resemble each other in their appetites, their manners, and conformations; being equally voracious, active, and roving.

The great agility of these animals prevents their often being taken. They seldom remain a moment above water; sometimes, indeed, their too eager pursuits expose them to danger; and a shoal of herrings often allures them out of their depth. In such a case, the hungry animal continues to flounder in the shallows till knocked on the head, or till the returning tide seasonably comes to its relief. But all this tribe, and the dolphin in particular, are not less swift than destructive. No fish could escape them, but from the awkward position of the mouth, which is placed in a manner under the head: yet, even with these disadvantages, their depredations are so great, that they have been justly styled the plunderers of the deep.

What could induce the ancients to a predilection in favour of these animals, particularly the dolphin, it is not easy to account for. Historians and philosophers seem to have contended who should invent the greatest number of fables concerning them. The dolphin was celebrated in the earliest time for its fondness to the human race, and was distinguished by the epithets of the boy-loving and philanthropist. Scarce an accident could happen at sea but the dolphin offered himself to convey the unfortunate to shore. The musician flung into the sea by pirates, the boy taking an airing into the midst of the sea, and returning again in safety, were obliged to the dolphin for its services. It is not easy, I say, to assign a cause why the ancients should thus have invented so many fables in their favour. The figure of these animals is far from prejudicing us in their interests; their extreme rapacity tends still less to endear them; I know nothing that can reconcile them to man and excite his prejudices, except that when taken they sometimes have a plaintive moan, with which they continue to express their pain till they expire. This, at first, might have excited human pity; and that might have produced human affection. At present, these fishes are regarded even by the vulgar in a very differ ent light; their appearance is far from being esteemed a favourable omen by the seamen; and from their boundings, springs, and frolics in the water, experience has taught the mariners to prepare for a storm.

But it is not to one circumstance only that the ancients have confined their fabulous reports concerning these animals; as from their leaps out of their element, they assume a temporary curvature, which is by no means their natural figure in the water, the old painters and sculptors have universally drawn them wrong. A dolphin is scarcely ever exhibited by the ancients in a straight shape, but curved, in the position which they sometimes appear in when exerting their force; and the poets too have adopted the general error. Even Pliny, the best naturalist, has asserted, that they instantly die when taken out of the water; but Rondelet, on the contrary, assures us, that he has seen a dolphin carried alive from Montpelier to Lyons.

The moderns have more just notions of these animals; and have got over the many fables, which every day's experience contradicts Indeed their numbers are so great, and, though shy, they are so often taken, that such peculiarities, if they were possessed of any, would have been long since ascertained. They are found, the porpoise especially, in such vast numbers, in all parts of the sea that surrounds this kingdom, that they are sometimes noxious to seamen, when they sail in small vessels. In some places they almost darken the water as they rise to take breath, and particularly before bad weather are much agitated, swimming against the wind, and tumbling about with unusual violence.

Whether these motions be the gambols of pleasure or the agitations of terror, is not well known. It is most probable that they dread those seasons of turbulence, when the lesser fishes sink to the bottom, and their prey no longer offers in sufficient abundance. In times of fairer weather they are seen herding together, and pursuing shoals of various fish with greater impetuosity. Their method of hunting their game, if it may be so called, is to follow in a pack, and thus give each other mutual assistance. At that season when the mackarel, the herring, the salmon, and other fish of passage, begin to make their appearance, the cetaceous tribes are seen fierce in the pursuit; urging their prey from one creek or bay to another, deterring them from the shallows, driving them towards each other's ambush, and using a greater variety of arts than hounds are seen to exert in pursuing the hare. However, the porpoise not only seeks for prey near the surface, but often descends to the bottom in search of sand-eels and sea-worms, which it roots out of the sand with its nose, in the manner hogs harrow up the fields for food. For this purpose, the nose projects a little, is shorter and stronger than that of the dolphin; and the neck is furnished with very strong muscles, which enable it the readier to turn up the sand.

But it sometimes happens, that the impetuosity, or the hunger, of these animals, in their usual pursuits, urges them beyond the limits of safety. The fishermen, who extend their long nets for pilchards, on the coast of Cornwall, have sometimes an unwelcome capture in one of these. Their feeble nets, which are calculated only for taking smaller prey, suffer a universal laceration, from the efforts of this strong animal to escape; and if it be not knocked on the head, before it has had time to flounder, the nets are destroyed, and the fishery interrupted. There is nothing, therefore, they so much dread, as the entangling a porpoise; and they do every thing to intimidate the animal from approaching.

Indeed, these creatures are so violent in the pursuit of their prey, that they sometimes follow a shoal of small fishes up a fresh-water river, from whence they find no small difficulty to return. We have often seen them taken in the Thames at London, both above the bridges and below them. It is curious enough to observe with what activity they avoid their pursuers, and what little time they require to fetch breath above the water. The manner of killing them is for four or five boats to spread over the part of the river in which they are seen, and with fire arms to shoot at them the instant they rise above the water. The fish being thus for some time kept in agitation, requires to come to the surface at quicker intervals, and thus affords the marksmen more frequent opportunities.

When the porpoise is taken, it becomes no inconsiderable capture, as it yields a very large quantity of oil; and the lean of some, particularly if the animal be young, is said to be as well tasted as veal. The inhabitants of Norway prepare from the eggs found in the body of this fish, a kind of caviar, which is said to be very delicate sauce, or good when even eaten with bread. There is a fishery for porpoise along the western isles of Scotland during the summer season, when they abound on that shore; and this branch of industry turns to good advantage.

As for the rest, we are told, that these animals go with young ten months; that, like the whale, they seldom bring forth above one at a time, and that in the midst of summer: that they live to a considerable age; though some say not above twenty-five or thirty years; and they sleep with the snout above water. They seem to possess, in a degree proportioned to their bulk, the manners of whales: and the history of one species of cetaceous animals, will, in a great measure serve for all the rest.

BOOK II.

OF CARTILAGINOUS FISHES.

CHAPTER I.

OF CARTILAGINOUS FISHES IN GENERAL.

WE have seen that fishes of the cetaceous kind bear a strong resemblance to quadrupeds in their conformation; those of the cartilaginous kinds are one remove separated from them: they form the shade that completes the imperceptible gradations of Nature.

The first great distinction they exhibit is, in having cartilages or gristles instead of bones. The cetaceous tribes have their bones entirely resembling those of quadrupeds, thick, white, and filled with marrow; those of the spinous kind, on the contrary, have small slender bones, with points resembling thorns, and generally solid throughout. Fishes of the cartilaginous kinds have their bones always soft and yielding; and age, that hardens the bones of other animals, rather contributes still more to soften theirs. The size of all fishes increases with age; but from the pliancy of the bones in this tribe, they seem to have no bound placed to their dimensions: and it is supposed that they grow larger every day till they die.

They have other differences, more obviously discernible. We have observed, that the cetaceous tribes had lungs like quadrupeds, a heart with its partition in the same manner, and apparatus for hearing; on the other hand, we mentioned that the spinous kinds had no organs of hearing, no lungs to breathe through, and no partition in the heart; but that their cold red blood was circulated by the means of the impulse made upon their gills by the water. Cartilaginous fishes unite both these systems in their conformation; like the cetaceous tribes, they have organs of hearing, and lungs; like the spinous kinds, they have gills, and a heart without a partition. Thus possessed of a twofold power of breathing, sometimes by means of their lungs, sometimes by that of their gills, they seem to unite all the advantages of which their situation is capable, and drawing from both elements every aid to their necessities or their enjoyments.

This double capacity of breathing in these animals, is one of the most remarkable features in the history of Nature. The apertures by which they breathe, are somewhere placed about the head; either beneath, as in flat fish; on the sides, as in sharks; or on the top of the head, as in pipe-fish. To these apertures are the gills affixed, but without any bone to open and shut them, as in spinous fishes; from which, by this mark, they may be easily distinguished, though otherwise very much alike in appearance. From these are bending cylindrical ducts, that run to the lungs, and are supposed to convey the air, that gives the organs their proper play. The heart, however, has but one valve; so that their blood wants that double circulation which obtains in the cetaceous kinds; and the lungs seem to me rather as an internal assistant to the gills, than fitted for supplying the same offices as in quadrupeds, for they want the pulmonary vein and artery.

From this structure, however, the animal is enabled to live a longer time out of water than those whose gills are more simple. The cartilaginous shark, or ray, live some hours after they are taken; while the spinous herring or mackarel expire a few minutes after they are brought on shore. From hence this tribe seems possessed of powers that other fishes are wholly deprived of; they can remain continually under water, without ever taking breath; while they can venture their heads above the deep, and continue for hours out of their native element.

We observed, in a former chapter, that spinous fishes have not, or at least appear not to have, externally any instruments of generation. It is very different with those of the cartilaginous kind, for the male always has these instruments double. The fish of this tribe are not unfrequently seen to copulate; and their manner is belly to belly, such as may naturally be expected from animals whose parts of generation are placed forward. They in general choose colder seasons and situations than other fish for propagating their kind; and many of them bring forth in the midst of winter.

The same duplicity of character which marks their general conformation, obtains also with regard to their bringing forth. Some bring forth their young alive; and some bring forth eggs, which are afterward brought to maturity. In all, however, the manner of gestation is nearly the same; for upon dissection, it is ever found, that the young, while in the body, continue in the egg till a very little time before they are excluded; these eggs they may properly be said to hatch within their body; and as soon as their young quit the shell, they begin to quit the womb also. Unlike to quadrupeds, or the cetaceous tribes, that quit the egg state a few days after their first conception, and continue in the womb several months after, these continue in the body of the female, in their egg state, for weeks together; and the eggs are found linked together by a membrane, from which, when the fœtus gets free, it continues but a very short time till it delivers itself from its confinement in the womb. The eggs themselves consist of a white and a yolk, and have a substance, instead of shell, that aptly may be compared to softened horn. These, as I observed, are sometimes hatched in the womb, as in the shark and ray kinds; and they are sometimes excluded, as in the sturgeon, before the animal comes to its time of disengaging. Thus we see that there seems very little difference between the viviparous and the oviparous kinds, in this class of fishes; the one hatch their eggs in the womb, and the young continue no long time there; the others exclude their eggs before hatching, and leave it to time and accident to bring their young to maturity.

Such are the peculiar marks of the cartilaginous class of fishes, of which there are many kinds. To give a distinct description of every fish is as little my intention, as perhaps it is the wish of the reader; but the peculiarities of each kind deserve notice, and the most striking of these it would be unpardonable to omit.

Cartilaginous fish may be divided, first, into those of the shark kind, with a body growing less towards the tail, a rough skin, with the mouth placed far beneath the end of the nose, five apertures on the sides of the neck for breathing, and the upper part of the tail longer than the lower. This class chiefly comprehends the Great White Shark, the Balance Fish, the Hound Fish, the Monk Fish, the Dog Fish, the Basking Shark, the Zygæna, the Tope, the Cat Fish, the Blue Shark, the Sea Fox, the Smooth Hound Fish, and the Porbeagle. These are all of the same nature, and differ more in size, than in figure or conformation.

The next division is that of the flat fish; and these, their broad, flat, thin shape is sufficiently capable of distinguishing from all others of this kind. They may be easily distinguished also from spinous flat fish, by the holes through which they breathe, which are uncovered by a bone; and which, in this kind, are five on each side. In this tribe we may place the Torpedo, the Skate, the Sharp-nosed Ray, the Rough Ray, the Thornback, and the Fire Flare.

The third division is that of the slender snake-shaped kind; such as the Lamprey, the Pride, and the Pipe Fish.

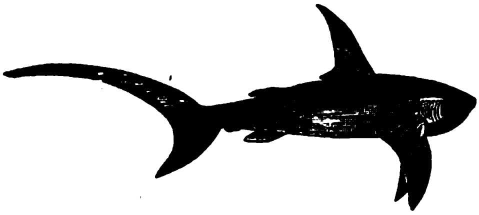
The fourth division is of the Sturgeon and its variety, the Isinglass Fish.

The last division may comprise fish of different figures and natures, that do not rank under the former divisions. These are the Sun Fish, the Tetrodon, the Lump Fish, the Sea Snail, the Chimæra, and the Fishing Frog. Each of these has somewhat peculiar in its powers or its form, that deserves to be remarked. The description of the figures of these at least may compensate for our general ignorance of the rest of their history.

CHAPTER II.

OF CARTILAGINOUS FISHES OF THE SHARK KIND.

OF all the inhabitants of the deep, those of the shark kind are the fiercest and the most voracious. The smallest of this tribe is not less dreaded by greater fish, than many that to appearance seem more powerful; nor do any of them seem fearful of attacking animals far above their size: but the Great White Shark, which is the largest of the kind, joins to the most amazing rapidity, the strongest appetites for mischief: as he approaches nearly in size to the whale, he far surpasses him in strength and celerity in the formidable arrangement of his teeth, and his insatiable desire of plunder



Long-tailed, or Fox Shark, p. 260.

White Shark, p. 260.

Hammer-headed Shark, p. 260.

To face p. 260, vol. iii.

The White Shark is sometimes seen to rank even among whales for magnitude; and is found from twenty to thirty feet long. Some assert that they have seen them of four thousand pounds weight; and we are told particularly of one, that had a human corpse in his belly. The head is large, and somewhat flatted; the snout long, and the eyes large. The mouth is enormously wide, as is the throat, and capable of swallowing a man with great ease. But its furniture of teeth is still more terrible; of these there are six rows, extremely hard, sharp-pointed, and of a wedgelike figure. It is asserted that there are seventy-two in each jaw, which make a hundred and forty-four in the whole; yet others think that their number is uncertain; and that in proportion as the animal grows older, these terrible instruments of destruction are found to increase. With these the jaws, both above and below, appear planted all over; but the animal has the power of erecting or depressing them at pleasure. When the shark is at rest, they lie quite flat in his mouth; but when he prepares to seize his prey, he erects all this dreadful apparatus, by the help of a set of muscles that join them to the jaw; and the animal he seizes, dies, pierced with a hundred wounds, in a moment.

Nor is this fish less terrible to behold as to the rest of his form: his fins are larger in proportion; he is furnished with great goggle eyes, that he turns with ease on every side, so as to see his prey behind him as well as before; and his whole aspect is marked with a character of malignity: his skin also is rough, hard, and prickly; being that substance which covers instrument cases, called shagreen.

As the shark is thus formidable in his appearance, so is he also dreadful from his courage and activity. No fish can swim so fast as he; none so constantly employed in swimming: he outstrips the swiftest ships, plays round them, darts out before them, returns, seems to gaze at the passengers, and all the while does not seem to exhibit the smallest symptoms of an effort to proceed. Such amazing powers, with such great appetites for destruction, would quickly unpeople even the ocean, but, providentially, the shark's upper jaw projects so far above the lower, that he is obliged to turn on one side, (not on his back, as is generally supposed,) to seize his prey. As this takes some small time to perform, the animal pursued seizes that opportunity to make its escape.

Still, however, the depredations he commits are frequent and formidable. The shark is the dread of sailors in all hot climates; where, like a greedy robber, he attends the ships, in expectation of what may drop overboard. A man who unfortunately falls into the sea at such a time, is sure to perish without mercy. A sailor that was bathing in the Mediterranean, near Antibes, in the year 1744, while he was swimming about fifty yards from the ship, perceived a monstrous fish making towards him, and surveying him on every side, as fish are often seen to look round a bait. The poor man, struck with terror at its approach, cried out to his companions in the vessel to take him on board. They accordingly threw him a rope with the utmost expedition, and were drawing him up by the ship's side, when the shark darted after him from the deep, and snapped off his leg.

Mr. Pennant tells us, that the master of a Guinea ship, finding a rage for suicide prevail among his slaves, from a notion the unhappy creatures had, that after death they should be restored again to their families, friends, and country; to convince them at least that some disgrace should attend them here, he ordered one of their dead bodies to be tied by the heels to a rope, and so let down into the sea; and, though it was drawn up again with great swiftness, yet in that short space, the sharks had bit off all but the feet. Whether this story is prior to an accident of the same kind, which happened at Belfast, in Ireland, about twenty years ago, I will not take upon me to determine; but certain it is, there are some circumstances alike in both, though more terrible in that I am going to relate. A Guinea captain was, by stress of weather, driven into Belfast, with a lading of very sickly slaves, who, in the manner above mentioned, took every opportunity to throw themselves overboard when brought up upon the deck, as is usual, for the benefit of the fresh air. The captain perceiving, among others, a woman slave attempting to drown herself, pitched upon her as a proper example to the rest. As he supposed that they did not know the terrors attending death, he ordered the woman to be tied with a rope under the arm-pits, and so let down into the water. When the poor creature was thus plunged in, and about half way down, she was heard to give a terrible shriek, which at first was ascribed to her fears of drowning; but soon after the water appearing red all around her, she was drawn up, and it was found that a shark, which had followed the ship, had bit her off from the middle.

Such is the frightful rapacity of this animal; nothing that has life is rejected. But it seems to have a peculiar enmity to man: when once it has tasted human flesh, it never desists from hunting those places where it expects the return of its prey. It is even asserted, that along the coasts of Africa, where these animals are found in great abundance, numbers of the Negroes, who are obliged to frequent the waters, are seized and devoured by them every year. The people of these coasts are firmly of opinion, that the shark loves the black man's flesh in preference to the white; and that when men of different colours are in the water together, it always makes choice of the former.

However this be, men of all colours are equally afraid of this animal, and have contrived different methods to destroy him. In general, they derive their success from the shark's own rapacity. The usual method of our sailors to take him, is by baiting a great hook with a piece of beef or pork, which is thrown out into the sea by a strong cord, strengthened near the hook with an iron chain. Without this precaution, the shark would quickly bite the cord in two, and thus set himself free. It is no unpleasant amusement to observe this voracious animal coming up to survey the bait, particularly when not pressed by hunger. He approaches it, examines it, swims round it, seems for a while to neglect it, perhaps apprehensive of the cord and the chain; he quits it for a little; but his appetite pressing, he returns again; appears preparing to devour it, but quits it once more. When the sailors have sufficiently diverted themselves with his different evolutions, they then make a pretence, by drawing the rope, as if intending to take the bait away; it is then that the glutton's hunger excites him; he darts at the bait, and swallows it, hook and all. Sometimes, however, he does not so entirely gorge the whole, but that he once more gets free; yet even then, though wounded and bleeding with the hook, he will again pursue the bait until he is taken. When he finds the hook lodged in his maw, his utmost efforts are then excited, but in vain, to get free; he tries with his teeth to cut the chain; he pulls with all his force to break the line; he almost seems to turn his stomach inside out to disgorge the hook; in this manner he continues his formidable though fruitless efforts; till, quite spent, he suffers his head to be drawn above water, and the sailors, confining his tail by a noose, in this manner draw him on shipboard, and despatch him.—This is done by beating him on the head till he dies; yet even that is not effected without difficulty and danger; the enormous creature, terrible even in the agonies of death, still struggles with his destroyers; nor is there an animal in the world that is harder to be killed Even when cut in pieces, the muscles still preserve their motion, and vibrate for some minutes after being separated from the body Another method of taking him, is by striking a barbed instrument called a fizgig, into his body, as he brushes along by the side of the ship. As soon as he is taken up, to prevent his flouncing, they cut off his tail with an axe, with the utmost expedition.

This is the manner in which Europeans destroy the shark; but some of the Negroes along the African coast, take a bolder and more dangerous method to combat their terrible enemy. Armed with nothing more than a knife, the Negro plunges into the water, where he sees the shark watching for his prey, and boldly swims forward to meet him; though the great animal does not come to provoke the combat, he does not avoid it, and suffers the man to approach him; but just as he turns upon his side to seize the aggressor, the Negro watches the opportunity, plunges his knife into the fish's belly, and pursues his blows with such success, that he lays the ravenous tyrant dead at the bottom; he soon however returns, fixes the fish's head in a noose, and drags him to shore, where he makes a noble feast for the adjacent villages.

Nor is man the only enemy this fish has to fear: the Remora, or Sucking Fish, is probably a still greater, and follows the shark every where. This fish has got the power of adhering to whatever it sticks against, in the same manner as a cupping-glass sticks to the human body. It is by such an apparatus that this animal sticks to the shark, and drains away his moisture. The seamen, however, are of opinion that it is seen to attend on the shark for more friendly purposes—to point him to his prey, and to apprize him of his danger. For this reason it has been called the Shark's Pilot.

The shark so much resembles the whale in size, that some have injudiciously ranked it in the class of cetaceous fishes; but its real rank is in the place here assigned it, among those of the cartilaginous kind It breathes with gills and lungs, its bones are gristly, and it brings forth several living young: Bellonius assures us, that he saw a female shark produce eleven live young ones at a time. But I will not take upon me to vouch for the veracity of Rondeletius, who, when talking of the blue shark, says, that the female will permit her small brood when in danger, to swim down her mouth, and take shelter in her belly. Mr. Pennant, indeed, seems to give credit to the story, and thinks that this fish, like the opossum, may have a place fitted by

Nature for the reception of her young. To his opinion much deference is due, and is sufficient, at least, to make us suspend our assent; for nothing is so contemptible as that affectation of wisdom which some display, by universal incredulity.

Upon the whole, a shark, when living, is a very formidable animal; and, when dead, is of very little value. The flesh is hardly digestible by any but the Negroes, who are fond of it to distraction; the liver affords three or four quarts of oil; some imaginary virtues have been ascribed to the brain; and its skin is, by great labour, polished into that substance called shagreen. Mr. Pennant is of opinion, that the female is larger than the male in all this tribe; which would, if confirmed by experience, make a striking agreement between them and birds of prey. It were to be wished that succeeding historians would examine into this observation, which is offered only as a conjecture.

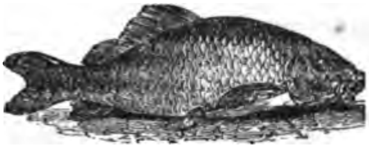
CHAPTER III.

OF CARTILAGINOUS FLAT FISH OF THE RAY KIND.

THE same rapacity which impels the shark along the surface of the water, actuates the flat fish at the bottom. Less active, and less formidable, they creep in security along the bottom, seize every thing that comes in their way; neither the hardest shells nor the sharpest spines give protection to the animals that bear them; their insatiable hunger is such, that they devour all; and the force of their stomach is so great, that it easily digests them.

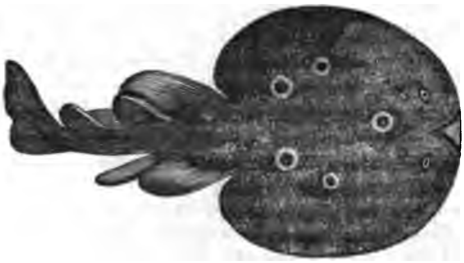
The whole of this kind resemble each other very strongly in their figure; nor is it easy, without experience, to distinguish one from another. The stranger to this dangerous tribe may imagine he is only handling a skate, when he is instantly struck numb by the torpedo; he may suppose he has caught a thornback, till he is stung by the fireflare. It will be proper, therefore, after describing the general figure of these animals, to mark their differences.

All fish of the ray kind are broad, cartilaginous, swimming flat on the water, and having spines on different parts of their body, or at the tail. They all have their eyes and mouth placed quite under the body, with apertures for breathing either about or near them. They all have teeth, or a rough bone, which answers the same purpose. Their bowels are very wide towards the mouth, and go on diminishing to the tail. The tail is very differently shaped from that of other fishes; and at first sight more resembling that of a quadruped, being narrow, and ending either in a bunch or a point. But what they are chiefly distinguished by is, their spines or prickles, which the different species have on different parts of their body. Some are armed with spines both above and below; others have them on the upper part only; some have their spines at the tail; some have three rows of them, and others



Carp, p. 256.

Skate, p. 264.



Torpedo, p. 266.

To face p. 264, vol. iii.

but one. These prickles in some are comparatively soft and feeble; those of others, strong and piercing. The smallest of these spines are usually inclining towards the tail; the larger towards the head.

It is by the spines that these animals are distinguished from each other. The skate has the middle of the back rough, and a single row of spines on the tail. The sharp-nosed ray has ten spines that are situated towards the middle of the back. The rough ray has its spines spread indiscriminately over the whole back. The thornback has its spines disposed in three rows upon the back. The fireflare has but one spine, but that indeed a terrible one. This dangerous weapon is placed on the tail, about four inches from the body, and is not less than five inches long. It is of a flinty hardness, the sides thin, sharp-pointed, and closely and sharply bearded the whole way. The last of this tribe that I shall mention is the torpedo; and this animal has no spines that can wound; but in the place of them it is possessed of one of the most potent and extraordinary faculties in Nature.

Such are the principal differences that may enable us to distinguish animals, some of which are of very great use to mankind, from others that are terrible and noxious. With respect to their uses indeed, as we shall soon see, they differ much; but the similitude among them, as to their nature, appetites, and conformation, is perfect and entire. They are all as voracious as they are plenty; and as dangerous to a stranger, as useful to him who can distinguish their difference.

Of all the larger fish of the sea, these are the most numerous; and they owe their numbers to their size. Except the white shark and cachalot alone, there is no other fish that has a swallow large enough to take them in; and their spines make them a still more dangerous morsel. Yet the size of some is such, that even the shark himself is unable to devour them: we have seen some of them in England weigh above two hundred pounds; but that is nothing to their enormous bulk in other parts of the world. Labat tells us of a prodigious ray that was speared by the Negroes at Guadaloupe, which was thirteen feet eight inches broad, and above ten feet from the snout to the insertion of the tail. The tail itself was in proportion, for it was not less than fifteen feet long, twenty inches broad at its insertion, and tapering to a point. The body was two feet in depth; the skin as thick as leather, and marked with spots; which spots, in all of this kind, are only glands, that supply a mucus to lubricate and soften the skin. This enormous fish was utterly unfit to be eaten by the Europeans; but the Negroes chose out some of the nicest bits, and carefully salted them up as the most favourite provision.

Yet, large as this may seem, it is very probable that we have seen only the smallest of the kind; as they generally keep at the bottom, the largest of the kind are seldom seen; and as they may probably have been growing for ages, the extent of their magnitude is unknown. It is generally supposed, however, that they are the largest inhabitants of the deep; and, were we to credit the Norway Bishop, there are some above a mile over. But to suppose an animal of such a magnitude is absurd; yet the overstretching the supposition does not destroy the probability that animals of this tribe grow to an enormous size

The ray generally chooses for its retreat such parts of the sea as have a black muddy bottom; the large ones keep at greater depths; but the smaller approach the shores, and feed upon whatever living animals they can surprise, or whatever putrid substances they meet with. As they are ravenous, they easily take the bait, yet will not touch it if it be taken up and kept a day or two out of water. Almost all fish appear much more delicate with regard to a baited hook than their ordinary food. They appear by their manner to perceive the line, and to dread it; but the impulse of their hunger is too great for their caution; and, even though they perceive the danger, if thoroughly hungry, they devour the destruction.

These fish generate in March and April; at which time only they are seen swimming near the surface of the water, several of the males pursuing one female. They adhere so fast together in coition, that the fishermen frequently draw both up together, though only one has been hooked. The females are prolific to an extreme degree; there having been no less than three hundred eggs taken out of the body of a single ray. The eggs are covered with a tough horny substance, which they acquire in the womb; for before they descend into that, they are attached to the ovary pretty much in the same manner as in the body of a pullet. From this ovary, or egg-bag, as it is vulgarly called, the fish's eggs drop one by one into the womb, and there receive a shell by the concretion of the fluids of that organ. When come to the proper maturity, they are excluded, but never above one or two at a time, and often at intervals of three or four hours. These eggs, or purses, as the fishermen call them, are usually cast about the beginning of May, and they continue casting during the whole summer. In October, when their breeding ceases, they are exceedingly poor and thin; but in November they begin to improve, and grow gradually better till May, when they are in the highest perfection.

'It is chiefly during the winter season that our fishermen take them, but the Dutch, who are indefatigable, begin their operations earlier, and fish with better success than we. The method practised by the fishermen of Scarborough is thought to be the best among the English; and, as Mr. Pennant has given a very succinct account of it, I will take leave to present it to the reader.

"When they go out to fish, each person is provided with three lines: each man's lines are fairly coiled upon a flat oblong piece of wicker-work; the hooks being baited and placed very regularly in the centre of the coil. Each line is furnished with two hundred and eighty hooks, at the distance of six feet two inches from each other. The hooks are fastened to lines of twisted horse hair, twenty seven inches in length.

"When fishing, there are always three men in each coble; and consequently nine of these lines are fastened together, and used as one line, extending in length near three miles, and furnished with above two thousand five hundred hooks. An anchor and a buoy are fixed at the first end of the line, and one more at each end of each man's lines· in all, four anchors, and four buoys made of leather or cork. The line is always laid across the current. The tides of flood and ebb continue an equal time upon our coasts; and, when undisturbed by winds, run each way about six hours. They are so rapid that the fishermen can only shoot and haul their lines a the turn of the tide; and therefore the lines always remain upon the ground about six hours. The same rapidity of tide prevents their using hand-lines; and, therefore, two of the people commonly wrap themselves in the sail and sleep, while the other keeps a strict look-out, for fear of being run down by ships, and to observe the weather; for storms often rise so suddenly that it is sometimes with extreme difficulty they escape to the shore, though they leave their lines behind them.

"The coble is twenty feet six inches long, and five feet extreme breadth. It is about one ton burden, rowed with three pair of oars, and admirably constructed for the purpose of encountering a mountainous sea. They hoist sail when the wind suits.

"The five-men boat is forty feet long, fifteen broad, and twenty-five tons burden. It is so called, though navigated by six men and a boy; because one of the men is hired to cook, and does not share in the profits of the other five.—All our able fishermen go in these boats to the herring fishery at Yarmouth, the latter end of September, and return about the middle of November. The boats are then laid up until the beginning of Lent, at which time they go off in them to the edge of the Dogger, and other places, to fish for turbot, cod, ling, skate, &c. They always take two cobles on board, and when they come upon their ground, anchor the boat, throw out the cobles, and fish in the same manner as those do who go from the shore in a coble; with this difference only, that here each man is provided with double the quantity of lines, and, instead of waiting the return of the tide in the coble, return to the boat, and bait their other lines; thus hauling one set, and shooting another, every turn of tide. They commonly run into the harbour twice a week, to deliver their fish. The five-men boat is decked at each end, but open in the middle, and has two long sails.

"The best bait for all kinds of fish, is fresh herring cut in pieces of a proper size; and, notwithstanding what has been said to the contrary, they are taken there at any time in the winter, and all the spring, whenever the fishermen put down their nets for that purpose: the five-men boats always take some nets for that end. Next to herrings are the lesser lampreys, which come all winter by land carriage from Tadcaster. The next baits in esteem are small haddocks cut in pieces, sand-worms, muscles, and limpets; and, lastly, when none of these can be found they use bullock's liver. The hooks used there are much smaller than those employed at Iceland and Newfoundland Experience has shown that the larger fish will take a living small one upon the hook, sooner than any bait that can be put on; therefore they use such as the fish can swallow. The hooks are two inches and a half long in the shank; and near an inch wide between the shank and the point. The line is made of small cording, and is always tanned before it is used. All the rays and turbots are extremely delicate in their choice of baits: if a piece of herring or haddock has been twelve hours out of the sea, and then used as a bait, they will not touch it."

Such is the manner of fishing for those fish that usually keep near the bottom on the coasts of England; and Duhamel observes, that the best weather for succeeding, is a half calm, when the waves are just curled with a silent breeze.

But this extent of line, which runs, as we have seen, three miles along the bottom, is nothing to what the Italians throw out in the Mediterranean. Their fishing is carried on in a tartan, which is a vessel much larger than ours; and they bait a line of no less than twenty miles long, with above ten or twelve thousand hooks. This line is called the *parasina:* and the fishing goes by that of the *pielago*. This line is not regularly drawn every six hours, as, with us but remains for some time in the sea, and it requires the space of twenty-four hours to take it up. By this apparatus they take rays, sharks, and other fish; some of which are above a thousand pounds weight. When they have caught any of this magnitude, they strike them through with a harpoon to bring them on board, and kill them as fast as they can.

This method of catching fish is obviously fatiguing, and dangerous; but the value of the capture generally repays the pain. The skate and the thornback are very good food, and their size, which is from ten pounds to two hundred weight, very well rewards the trouble of fishing for them. But it somestimes happens that he lines are visited by very unwelcome intruders; by the rough ray, the fire-flare, or the torpedo. To all these the fishermen have the most mortal antipathy; and when discovered shudder at the sight: however, they are not always so much upon their guard, but that they sometimes feel the different resentments of this angry tribe; and, instead of a prize, find thay have caught a vindictive enemy. When such is the case, they take care to throw them back tnto the sea with the swiftest expedition.

The rough ray inflicts but slight wounds with the prickles with which its whole body is furnished. To the ignorant it seems harmless, and a man at first sight would venture to take it in his hand, without any apprehension; but he soon finds, that there is not a single part of its body that is not armed with spines; and that there is no way of seizing the animal but by the little fin at the end of the tail.

But this animal is harmless when compared to the fire-flare, which seems to be the dread of even the boldest and most experienced fishermen. The weapon, with which Nature has armed this animal, which grows from the tail, and which we described as barbed, and five inches long, hath been an instrument of terror to the ancient fishermen as well as the modern: and they have delivered many tremendous fables of its astonishing effects. Pliny, Ælian, and Oppian have supplied it with a venom that affects even the inanimate creation; trees that are struck by it instantly lose their verdure, and rocks themselves are incapable of resisting the potent poison. The enchantress Circe armed her son with a spear headed with the spine of the trigon, as the most irresistible weapon she could furnish him with; a weapon that soon after was to be the death of his own father.

"That spears and darts," says Mr. Pennant, might, in very early times, have been headed with bone instead of iron, we have no doubt. The Americans head their arrows with the bones of fishes to this day: and from their hardness and sharpness they are no contemptible weapons. But that this spine is possessed of those venomous qualities ascribed to it, we have every reason to doubt; though some men of high reputation, and the whole body of fishermen, contend for its venomous effects. It is, in fact, a weapon of offence belonging to this animal, and capable, from its barbs, of inflicting a very terrible wound, attended with dangerous symptoms; but it cannot be possessed of any poison, as the spine has no sheath to preserve the supposd venom on its surface: and the animal has no gland that separates the noxious fluid: besides, all those animals that are furnished with envenomed fangs or stings, seem to have them strongly connected with their safety and existence; they never part with them; there is an apparatus of poison prepared in the body to accompany their exertions; and when the fangs or stings are taken away, the animal languishes and dies. But it is otherwise with the spine of the fire-flare; it is fixed to the tail, as a quill is into the tail of the fowl, and is annually shed in the same manner: it may be necessary for the creature's defence, but it is no way necessary for its existence. The wound inflicted by an animal's tail, has something terrible in the idea, and may from thence alone be supposed to be fatal. From hence terror might have added poison to the pain, and called up imagined dangers: the Negroes universally believe that the sting is poisonous; but they never die of the wound; for by opening the fish, and laying it to the part injured, it effects a speedy cure. The slightness of the remedy proves the innocence of the wound."

The Torpedo is an animal of this kind, equally formidable and well known with the former; but the manner of its operating is to this hour a mystery to mankind. The body of this fish is almost circular, and thicker than others of the ray kind; the skin is soft, smooth, and of a yellowish colour, marked, as all the kind with large annular spots; the eyes very small; the tail tapering to a point; and the weight of the fish from a quarter to fifteen pounds. Redi found one twenty-four pounds weight. To all outward appearance, it is furnished with no extraordinary powers; it has no muscles formed for particularly great exertions; no internal confirmation perceptibly differing from the rest of its kind; yet such is that unaccountable power it possesses, that, the instant it is touched, it benumbs not only the hand and arm, but sometimes also the whole body. The shock received, by all accounts, most resembles the stroke of an electrical machine; sudden, tingling, and painful. "The instant," says Kempfer, "I touched it with my hand, I felt a terrible numbness in my arm, and as far up as the shoulder. Even if one treads upon it with the shoe on, it affects not only the leg, but the whole thigh upwards. Those who touch it with the foot are seized with a stronger palpitation than even those who touched it with the hand. This numbness bears no resemblance to that which we feel when a nerve is a long time pressed, and the foot is said to be asleep; it rather appears like a sudden vapour, which passing through the pores in an instant penetrates to the very springs of life, from whence it diffuses itself over the whole body, and gives real pain. The nerves are so affected that the person struck imagines all the bones of his body, and particularly those of the limb that received the blow, are driven out of joint. All this is accompanied with an universal tremor, a sickness of the stomach, a general convulsion, and a total suspension of the faculties of the mind. In short," continues Kempfer, "such is the pain, that all the force of our promises and authority could not prevail upon a seaman to undergo the shock a second time. A Negro, indeed, that was standing by, readily undertook to touch the torpedo, and was seen to handle it without feeling any of its effects. He informed us, that his whole secret consisted in keeping in his breath; and we found, upon trial, that this method answered with ourselves. When we held in our breath, the torpedo was harmless; but when we breathed ever so little, its efficacy took place."

Kempfer has very well described the effects of this animal's shock; but succeeding experience has abundantly convinced us, that holding in the breath, noway guards against its violence. Those, therefore, who depending on that receipt, should play with a torpedo, would soon find themselves painfully deceived: not but that this fish may be many times touched with perfect security; for it is not upon every occasion that it exerts its potency. Reaumur, who made several trials upon this animal, has at least convinced the world that it is not necessarily, but by an effort, that the torpedo numbs the hand of him that touches it. He tried several times, and could easily tell when the fish intended the stroke, and when it was about to continue harmless. Always before the fish intended the stroke, it flattened the back, raised the head and the tail, and then, by a violent contraction in the opposite direction, struck with its back against the pressing finger, and the body, which before was flat, became humped and round.

But we must not infer, as he has done, that the whole effect of this animal's exertions arise from the greatness of the blow which the fingers receive at the instant they are struck. We will, with him, allow, that the stroke is very powerful, equal to that of a musket-ball, since he will have it so; but it is very well known, that a blow, though never so great on the points of the fingers, diffuses no numbness over the whole body: such a blow might break the ends of the fingers indeed, but would hardly numb the shoulder. Those blows that numb, must be applied immediately to some great and leading nerve, or to a large surface of the body; a powerful stroke applied to the points of the fingers will be excessively painful indeed, but the numbness will not reach beyond the fingers themselves. We must, therefore, look for another cause producing the powerful effects wrought by the torpedo.

Others have ascribed it to a tremulous motion which this animal is found to possess, somewhat resembling that of a horse's skin, when stung by a fly. This operating under the touch with an amazing quickness of vibration, they suppose produces the uneasy sensation described above; something similar to what we feel when we rub plush cloth against the grain. But the cause is quite disproportioned to the effect; and so much beyond our experience, that this solution is as difficult as the wonder we wanted to explain.

The most probable solution seems to be, that the shock proceeds from an animal electricity, which this fish has some hidden power of storing up, and producing on its most urgent occasions. The shocks are entirely similar; the duration of the pain is the same; but how the animal contrives to renew the charge, how it is prevented from evaporating it on contiguous objects, how it is originally procured, these are difficulties that time alone can elucidate.

But to know even the effects is wisdom. Certain it is that the powers of this animal seem to decline with its vigour; for as its strength ceases, the force of the shock seems to diminish; till, at last, when the fish is dead, the whole power is destroyed, and it may be handled or eaten with perfect security: on the contrary, when immediately taken out of the sea, its force is very great, and not only affects the hand, but if even touched with a stick, the person finds himself sometimes affected. This power, however, is not to be extended to the degree that some would have us believe; as reaching the fishermen at the end of the line, or numbing fishes in the same pond. Godignus, in his history of Abyssinia, carries this quality to a most ridiculous excess; he tells us of one of these that was put into a basket among a number of dead fishes, and that the next morning the people, to their utter astonishment, perceived, that the torpedo had actually numbed the dead fishes into life again.

To conclude, it is generally supposed that the female torpedo is much more powerful than the male. Lorenzini, who has made several experiments upon this animal, seems convinced that its power wholly resides in two thin muscles that cover a part of the back. These he calls the trembling fibres; and he asserts that the animal may be touched with safety in any other part. It is now known also that there are more fish than this of the ray kind, possessed of the numbing quality, which has acquired them the name of the torpedo. These are described by Atkins and Moore, and found in great abundance along the coast of Africa. They are shaped like a mackarel, except that the head is much larger; the effects of these seem also to differ in some respects. Moore talks of keeping his hand upon the animal; which in the ray torpedo it is actually impossible to do. "There was no man in the company," says he, "that could bear to keep his hand on this animal the twentieth part of a minute, it gives him so great pain; but upon taking the hand away, the numbness went off, and all was well again. This numbing quality continued in this torpedo even after it was dead; and the very skin was still possessed of its extraordinary powers till it became dry." Condamine informs us of a fish possessed of the powers of the torpedo, of a shape very different from the former, and every way resembling a lamprey. This animal, if touched by the hand, or even with a stick, instantly benumbs the hand and arm to the very shoulder; and sometimes the man falls down under the blow. These animals, therefore, must affect the nervous system in a different manner from the former, both with respect to the manner and the intention; but how this effect is wrought, we must be content to dismiss in obscurity.

CHAPTER IV.

OF THE LAMPREY AND ITS AFFINITIES.

THERE is a species of the Lamprey served up as a great delicacy among the modern Romans, very different from ours. Whether theirs be the murena of the ancients I will not pretend to say; but there is nothing more certain than that our lamprey is not. The Roman lamprey agrees with the ancient fish in being kept in ponds, and considered by the luxurious as a very great delicacy.

The lamprey, known among us, is differently estimated, according to the season in which it is caught, or the place where it has been fed. Those that leave the sea to deposit their spawn in fresh waters are the best: those that are entirely bred in our rivers, and that have never been at sea, are considered as much inferior to the former. Those that are taken in the months of March, April, or May, just upon their leaving the sea, are reckoned very good; those that are caught after they have cast their spawn, are found to be flabby and of little value. Those caught in several of the rivers in Ireland the people will not venture to touch, those of the English Severn are considered as the most delicate of all other fish whatever.

The lamprey much resembles an eel in its general appearance, but is of a lighter colour, and rather a clumsier make. It differs, however, in the mouth, which is round, and placed rather obliquely below the end of the nose. It more resembles the mouth of a leech than an eel; and the animal has a hole on the top of the head through which it spouts water, as in the cetaceous kind. There are seven holes on each side for respiration; and the fins are formed rather by a lengthening out of the skin, than any set of bones or spines for that purpose. As the mouth is formed resembling that of a leech, so it has a property resembling that animal of sticking close to and sucking any body it is applied to. It is extraordinary the power they have of adhering to stones; which they do so firmly, as not to be drawn off without some difficulty. We are told of one that weighed but three pounds: and yet it stuck so firmly to a stone of twelve pounds that it remained suspended at its mouth, from which it was separated with no small difficulty. This amazing power of suction is supposed to arise from the animal's exhausting the air within its body by the hole over the nose, while the mouth is closely fixed to the object, and permits no air to enter. It would be easy to determine the weight this animal is thus able to sustain; which will be equal to the weight of a column of air of equal diameter with the fish's mouth.

From some peculiarity of formation, this animal swims generally with its body as near as possible to the surface; and it might easily be drowned by being kept by force for any time under water. Muralto has given us the anatomy of this animal; but, in a very minute description, makes no mention of lungs. Yet I am very apt to suspect, the two red glands, tissued with nerves, which he describes as lying towards the back of the head, are no other than the lungs of this animal. The absolute necessity it is under of breathing in the air, convinces me that it must have lungs, though I do not know of any anatomist that has described them.

The adhesive quality in the lamprey may be in some measure increased by that slimy substance with which its body is all over smeared; a substance that serves at once to keep it warm in its cold element, and also to keep its skin soft and pliant. This mucus is separated by two long lymphatic canals, that extend on each side from the head to the tail, and that furnish it in great abundance. As to its intestines, it seems to have but one great bowel, running from the mouth to the vent, narrow at both ends, and wide in the middle.

So simple a conformation seems to imply an equal simplicity of appetite. In fact, the lamprey's food is either slime and water, or such small water insects as are scarcely perceivable. Perhaps its appetite may be more active at sea, of which it is properly a native; but when it comes up into our rivers, it is hardly perceived to devour any thing.

Its usual time of leaving the sea, which it is annually seen to do in order to spawn, is about the beginning of spring; and after a stay of a few months it returns again to the sea. Their preparation for spawning is peculiar; their manner is to make holes in the gravelly bottom of rivers; and on this occasion their sucking power is particularly serviceable; for if they meet with a stone of a considerable size, they will remove it and throw it out. Their young are produced from eggs in the manner of flat fish; the female remains near the place where they are excluded; and continues with them till they come forth. She is sometimes seen with her whole family playing about her; and after some time she conducts them in triumph back to the ocean.

But some have not sufficient strength to return; and these continue in the fresh water till they die. Indeed the life of this fish, according to Rondeletius, who has given its history, is but of very short continuance; and a single brood is the extent of the female's fertility. As soon as she has returned, after casting her eggs, she seems exhausted and flabby. She becomes old before her time; and two years is generally the limit of her existence.

However this may be, they are very indifferent eating after they have cast their eggs, and particularly at the approach of hot weather. The best season for them is the months of March, April, and May; and they are usually taken in nets with salmon, and sometimes in baskets at the bottom of the river. It has been an old custom for the city of Gloucester, annually to present the king with a lamprey pie; and as the gift is made at Christmas, it is not without great difficulty the corporation can procure the proper quantity, though they give a guinea apiece for taking them.

How much they were valued among the ancients, or a fish bearing some resemblance to them, appears from all the classics that have praised good living or ridiculed gluttony. One story we are told of this fish with which I will conclude its history. A senator of Rome, whose name does not deserve being transmitted to posterity, was famous for the delicacy of his lampreys. Tigelinus, Manucius and al the celebrated epicures of Rome, were loud in his praises: no man's fish had such a flavour, was so nicely fed, or so exactly pickled. Augustus, hearing so much of this man's entertainments, desired to be his guest; and soon found that fame had been just to his merits; the man had indeed very fine lampreys, and of an exquisite flavour. The emperor was desirous of knowing the method by which he fed his fish to so fine a relish; and the glutton, making no secret of his art, informed him that his way was to throw into his ponds such of his slaves as had at any time displeased him. Augustus, we are told, was not much pleased with this receipt, and instantly ordered all his ponds to be filled up. The story would have ended better if he had ordered the owner to be flung in also.

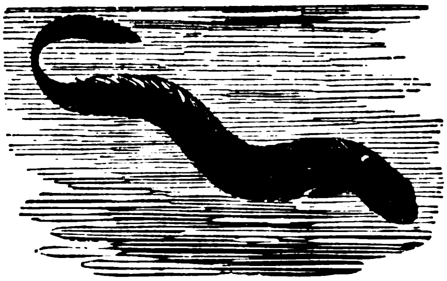
CHAPTER V.

THE STURGEON AND ITS VARIETIES.

THE Sturgeon, with a form as terrible, and a body as large, as the shark, is yet as harmless as the fish we have been just describing; incapable and unwilling to injure others, it flies from the smallest fishes, and generally falls a victim to its own timidity.

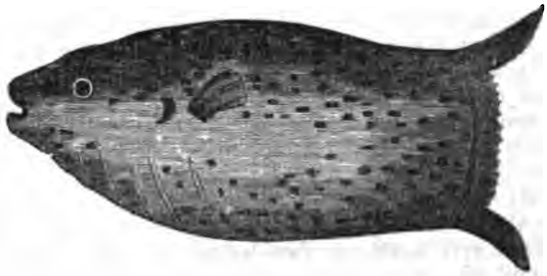
The sturgeon, in its general form, resembles a fresh-water pike.—The nose is long; the mouth is situated beneath, being small, and without jaw-bones or teeth. But, though it is so harmless and ill provided for war, the body is formidable enough to appearance. It is long, pentagonal, and covered with five rows of large, bony knobs, one row on the back and two on each side, and a number of fins to give it greater expedition. Of this fish there are three kinds; the Common Sturgeon, the Caviar Sturgeon, and the Huso, or Isinglass-fish. The first has eleven knobs or scales on the back; the second has fifteen; and the latter thirteen on the back, and forty-three on the tail. These differences seem slight to us who only consider the animal's form; but those who consider its uses find the distinction of considerable importance. The first is the sturgeon, the flesh of which is sent pickled into all parts of Europe. The second is the fish from the roe of which that noted delicacy called Caviar is made; and the third, besides supplying the caviar, furnishes also the valuable commodity of isinglass. They all grow to a very great size, and some of them have been found above eighteen feet long.

There is not a country in Europe but what this fish visits at different seasons; it annually ascends the largest rivers to spawn, and propagates in an amazing number. The inhabitants along the banks of the Po, the Danube, and the Wolga, make great profit yearly of its incursions up the streams, and have their nets prepared for its reception. The sturgeon also is brought daily to the markets of Rome and Venice, and they are known to abound in the Mediterranean sea



Blenny, p. 285.

Short Diodon, p. 278.



Oblong Diodon, or Sun Fish, p. 278.

To face p. 274, vol. iii.

Yet those fish that keep entirely either in salt or fresh water are but comparatively small. When the sturgeon enjoys the vicissitude of fresh and salt water, it is then that it grows to an enormous size, so as almost to rival even the whale in magnitude.

Nor are we without frequent visits from this much-esteemed fish in England. It is often accidentally taken in our rivers in salmon nets, and particularly in those parts that are not far remote from the sea. The largest we have heard of, caught in Great Britain, was a fish taken in the Eske, where they are most frequently found, which weighed four hundred and sixty pounds. An enormous size to those who have only seen our fresh-water fishes!

North America also furnishes the sturgeon; their rivers in May, June, and July, supply them in very great abundance. At that time they are seen sporting in the water, and leaping from its surface several yards into the air. When they fall again on their sides, the concussion is so violent, that the noise is heard in still weather at some miles distance.

But of all places where this animal is to be found, it appears nowhere in such numbers as in the lakes of Frischehaff and Curischaff, near the city of Pillau. In the rivers also that empty themselves into the Euxine Sea, this fish is caught in great numbers, particularly at the mouth of the river Don. In all these places the fishermen regularly expect their arrival from the sea, and have their nets and salt ready prepared for their reception.

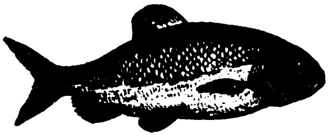
As the sturgeon is a harmless fish and noway voracious, it is never caught by a bait in the ordinary manner of fishing, but always in nets. From the description given above of its mouth, it is not to be supposed that the sturgeon would swallow any hook capable of holding so large a bulk and so strong a swimmer. In fact, it never attempts to seize any of the finny tribe, but lives by rooting at the bottom of the sea, where it makes insects and sea-plants its whole subsistence. From this quality of floundering at the bottom it has received its name; which comes from the German verb *stoeren*, signifying to wallow in the mud. That it lives upon no large animals is obvious to all those who cut it open, where nothing is found in its stomach but a kind of slimy substance, which has induced some to think it lives only upon water and air. From hence there is a German proverb, which is applied to a man extremely temperate, when they say, he is as moderate as a sturgeon.

As the sturgeon is so temperate in its appetites, so is it also equally timid in its nature. There would be scarce any method of taking it, did not its natural desire of propagation induce it to incur so great a variety of dangers. The smallest fish is alone sufficient to terrify a shoal of sturgeons; for, being unfurnished with any weapon of defence, they are obliged to trust to their swiftness and their caution for security. Like all animals that do not make war upon others, sturgeons live in society among themselves; rather for the purposes of pleasure than from any power of mutual protection. Gesner even asserts, that they are delighted with sounds of various kinds; and that he has seen them shoal together, at the notes of a trumpet.

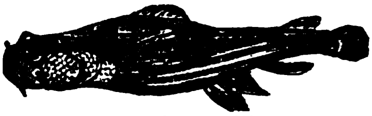
The usual time, as was said before, for the sturgeon to come up rivers to deposit its spawn, is about the beginning of summer, when the fishermen of all great rivers make a regular preparation for its reception. At Pillau, particularly, the shores are formed into districts, and allotted to companies of fishermen, some of which are rented for about three hundred pounds a year. The nets in which the sturgeon is caught, are made of small cord, and placed across the mouth of the river; but in such a manner that, whether the tide ebbs or flows, the pouch of the net goes with the stream. The sturgeon thus caught, while in the water, is one of the strongest fishes that swims, and often breaks the net to pieces that encloses it; but the instant it is raised with its head above water, all its activity ceases; it is then a lifeless, spiritless lump, and suffers itself to be tamely dragged on shore. It has been found prudent, however, to draw it to shore gently; for, if excited by any unnecessary violence, it has been found to break the fisherman's legs with a blow of its tail. The most experienced fishers therefore, when they have drawn it to the brink, keep the head still elevated, which prevents its doing any mischief with the hinder part of the body: others, by a noose, fasten the head and the tail together; and thus, without immediately despatching it, bring it to the market, if there be one near, or keep it till their number is completed for exportation.

The flesh of this animal, pickled, is very well known at all the tables of Europe; and is even more prized in England than in any of the countries where it is usually caught. The fishermen have two different methods of preparing it. The one is by cutting it in long pieces lengthwise, and, having salted them, by hanging them up in the sun to dry: the fish thus prepared is sold in all the countries of the Levant, and supplies the want of better provision. The other method, which is usually practised in Holland, and along the shores of the Baltic, is to cut the sturgeon crosswise, into short pieces, and put it into small barrels, with a pickle made of salt and saumure. This is the sturgeon which is sold in England; and of which great quantities came from the North, until we gave encouragement to the importation of it from North America. From thence we are very well supplied; but it is said, not with such good fish as those imported from the North of Europe.

A very great trade is also carried on with the roe of the sturgeon, preserved in a particular manner, and called Caviar: it is made from the roe of all kinds of sturgeon, but particularly the second. This is much more in request in other countries of Europe than with us. To all these high-relished meats, the appetite must be formed by degrees; and though formerly even in England it was very much in request at the politest tables, it is at present sunk entirely into disuse. It is still, however, a considerable merchandize among the Turks, Greeks, and Venetians. Caviar somewhat resembles soft soap in consistence; but it is of a brown, uniform colour, and is eaten as cheese with bread. The manner of making it is this: they take the spawn from the body of the sturgeon—for it is to be observed that the sturgeon differs from other cartilaginous fish, in that it has spawn like a cod, and not eggs like a ray. They take the spawn, I say, and freeing it from the small membranes that connect it together, they wash it with vinegar, and afterward spread it to dry upon a table; they then put it into a vessel with salt, breaking the spawn with their hands

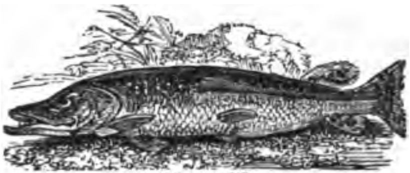


Roach, p. 284.

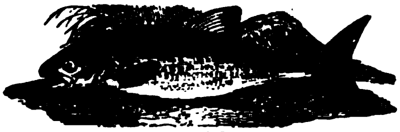


Loach, p. 283.

Pipe Fish, p. 279.



Pike, p. 288.



Charr. p. 286.

To face p. 276, vol. iii.

and not with a pestle; this done, they put it into a canvass bag, letting the liquor drain from it; lastly, they put it into a tub, with holes in the bottom, so that, if there be any moisture still remaining, it may run out: then it is pressed down, and covered up close for use.

But the Huso or Isinglass Fish furnishes a still more valuable commodity. This fish is caught in great quantities in the Danube, from the months of October to January: it is seldom under fifty pounds weight, and often above four hundred: its flesh is soft, glutinous, and flabby; but it is sometimes salted, which makes it better tasted, and then it turns red like salmon. It is for the commodity it furnishes that it is chiefly taken. Isinglass is of a whitish substance, inclining to yellow, done up into rolls, and so exported for use. It is very well known as serviceable, not only in medicine, but many arts. The varnisher, the wine merchant, and even the clothier know its uses and very great sums are yearly expended upon this single article of commerce. The manner of making it is this; they take the skin the entrails, the fins, and the tail of this fish, and cut them into small pieces; these are left to macerate in a sufficient quantity of warm water, and they are all boiled shortly after with a slow fire, until they are dissolved and reduced to a jelly; this jelly is spread upon instruments made for the purpose, so, that in drying, it assumes the form of parchment, and when quite dry, it is then rolled in the form which we see it in the shops.

This valuable commodity is principally furnished from Russia, where they prepare great quantities surprisingly cheap. Mr. Jackson, an ingenious countryman of our own, found out an obvious method of making a glue at home that answered all the purposes of isinglass; but what with the trouble of making it, and perhaps the arts put in practice to undersell him, he was, as I am told, obliged to discontinue the improvement of his discovery. Indeed, it is a vain attempt to manufacture among ourselves those things which may be more naturally and cheaply supplied elsewhere. We have many trades that are unnaturally, if I may so express it, employed among us; who furnish more laboriously those necessaries with which other counties could easily and cheaply supply us. It would be wiser to take what they can thus produce; and to turn our artisans to the increase and manufacture of such productions as thrive more readily among us. Were, for instance, the number of hands that we have now employed in the manufacture of silk, turned to the increase of agriculture, it is probable that the increased quantity of corn thus produced, would be more than an equivalent for the diminution of national wealth in purchasing wrought silk from other countries.

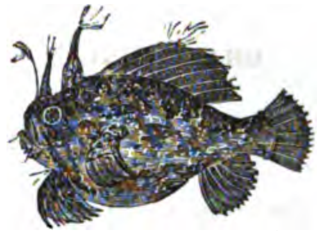
CHAPTER VI.

OF ANOMALOUS CARTILAGINOUS FISHES.

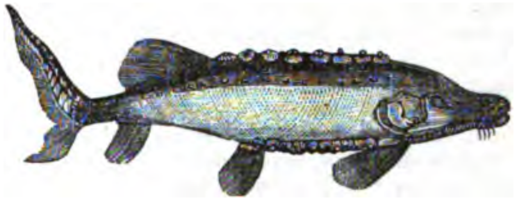
OF all others, the Cartilaginous class seems to abound with the greatest variety of ill-formed animals; and, if philosophy could allow the expression, we might say, that the cartilaginous class was the class of monsters: in fact, it exhibits a variety of shapeless beings, the deviations of which from the usual form of fishes are beyond the power of words to describe, and scarcely of the pencil to draw. In this class we have the Pipe Fish, that almost tapers to a thread, and the Sun Fish, that has the appearance of a bulky head, but the body cut off in the middle; the Hippocampus, with a head somewhat like that of a horse, and the Water Bat, whose head can scarcely be distinguished from the body. In this class we find the Fishing Frog, which from its deformity some have called the Sea Devil, the Chimæra, the Lump Fish, the Sea Porcupine, and the Sea Snail. Of all these the history is but little known; and naturalists supply the place with description.

The Sun Fish sometimes grows to a very large size; one taken near Plymouth was five hundred weight. In form it resembles a bream, or some deep fish cut off in the middle: the mouth is very small, and contains in each jaw two broad teeth, with sharp edges the colour of the back is dusky and dappled, and the belly is of a silvery white. When boiled, it has been observed to turn to a glutinous jelly, and would most probably serve for all the purposes of isinglass, were it found in sufficient plenty.

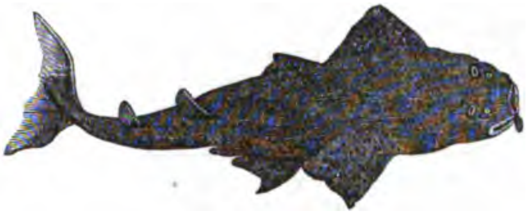
The Fishing Frog in shape very much resembles a tadpole or young frog, but then a tadpole of enormous size, for it grows to above five feet long, and its mouth is sometimes a yard wide. Nothing can exceed its deformity. The head is much bigger than the whole body; the under jaw projects beyond the upper, and both are armed with rows of slender, sharp teeth; the palate and the tongue are furnished with teeth in like manner; the eyes are placed on the top of the head and are encompassed with prickles: immediately above the nose are two long beards or filaments, small in the beginning, but thicker at the end, and round: these, as it is said, answer a very singular purpose; for being made somewhat resembling a fishing-line, it is asserted, that the animal converts them to the purposes of fishing. With these extended, as Pliny asserts, the fishing frog hides in muddy waters, and leaves nothing but the beards to be seen; the curiosity of the smaller fish brings them to view these filaments, and their hunger induces them to seize the bait; upon which the animal in ambush instantly draws in its filaments, with the little fish that had taken the bait, and devours it without mercy. This story, though apparently improbable, has found credit among some of our best naturalists; but what induces me to doubt the fact is, that there is another species of this animal that has no beards, which it would not want if they were necessary to the existence of the kind. Rondeletius informs us, tha



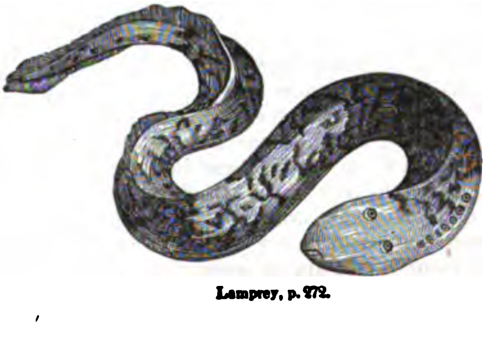
Angler, or Fishing Frog, p. 273.



Sturgeon, p. 263.



Monkfish, p. 260.



Lamprey, p. 272.

To face p. 278, vol. iii.

Lump Sucker, p. 279

Hippocampus, p. 279.

Sea Porcupine, p. 280.

Gymnotus, or Electrical Eel, p. 282.

To face p. 279, vol. iii.

If we take out the bowels, the body will appear with a kind of transparence; and that if a lighted candle be placed within the body, as in a lantern, the whole has a very formidable appearance. The fishermen, however, have in general a great regard for this ugly fish, as it is an enemy to the dog-fish, the bodies of those fierce and voracious animals being often found in its stomach; whenever they take it, therefore, they always set it at liberty.

The Lump Fish is trifling in size, compared to the former: its length is but sixteen inches, and its weight about four pounds; the shape of the body is like that of a bream, deep, and it swims edgewise; the back is sharp and elevated, and the belly flat; the lips, mouth, and tongue of this animal are of a deep red; the whole skin is rough, with bony knobs; the largest row is along the ridge of the back; the belly is of a bright crimson colour: but what makes the chief singularity in this fish, is an oval aperture in the belly, surrounded with a fleshy soft substance, that seems bearded all round; by means of this part it adheres with vast force to any thing it pleases. If flung into a pail of water, it will stick so close to the bottom, that on taking the fish by the tail, one may lift up pail and all, though it holds several gallons of water. Great numbers of these fish are found along the coasts of Greenland in the beginning of summer, where they resort to spawn. The roe is remarkably large, and the Greenlanders boil it to a pulp for eating. They are extremely fat, but not admired in England, being both flabby and insipid.

The Sea Snail takes its name from the soft and unctuous texture of its body, resembling the snail upon land. It is almost transparent, and soon dissolves and melts away. It is but a little animal, being not above five inches long. The colour, when fresh taken, is of a pale brown, the shape of the body round, and the back fin reaches all the way from the head to the tail. Beneath the throat is a round depression, of a whitish colour, surrounded by twelve brown spots, placed in a circle. It is taken in England at the mouths of rivers, four or five miles distant from the sea.

The body of the Pipe Fish, in the thickest part, is not thicker than a swan-quill, while it is above sixteen inches long. This is angular, but the angles being not very sharp, they are not discernible until the fish is dried. Its general colour is an olive brown, marked with numbers of bluish lines, pointing from the back to the belly. It is viviparous; for on crushing one that was just taken, hundreds of very minute young ones were observed to crawl about.

The Hippocampus, which, from the form of the head, some call the Sea Horse, never exceeds nine inches in length. It is about as thick as a man's thumb, and the body is said, while alive, to have hair on the forepart, which falls off when it is dead. The snout is a sort of a tube with a hole at the bottom, to which there is a cover, which the animal can open and shut at pleasure. Behind the eyes there are two fins which look like ears; and above them are two holes which serve for respiration. The whole body seems to be composed of cartilaginous rings, on the intermediate membranes of which several small prickles are placed. It is found in the Mediterranean, and also in the Western Ocean; and, upon the whole, more resembles a great caterpillar than a fish. The ancients considered it as extremely venomous; probably induced by its peculiar figure.

From these harmless animals, covered with a slight coat of mail we may proceed to others, more thickly defended, and more formidably armed, whose exact station in the scale of fishes is not yet ascertained. While Linnæus ranks them among the cartilaginous kinds a later naturalist places them among the spinous class. With which tribe they most agree, succeeding observations must determine. At present we seem better acquainted with their figure than their history; their deformity is obvious; and the venomous nature of the greatest number has been confirmed by fatal experience.—This circumstance, as well as the happy distance at which they are placed from us, being all found in the Oriental or American seas, may have prevented a more critical inquiry; so that we know but little of the nature of their malignity, and still less of their pursuits and enmities in the deep.

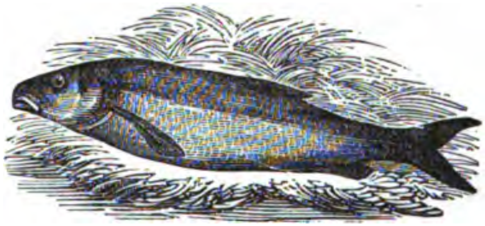
In the first of this tribe we may place the Sea Orb, which is almost round, has a mouth like a frog, and is from seven inches to two feet long. Like the porcupine, from whence it sometimes takes its name, being also called the Sea Porcupine, it is covered over with long thorns or prickles, which point on every side; and, when the animal is enraged, it can blow up its body as round as a bladder. Of this extraordinary creature there are many kinds: some threatening only with spines, as the Sea Hedgehog; others defended with a bony helmet that covers the head, as the Ostracion; others with a coat of mail from the head to the tail, where it terminates in a point, as the Centriscus; and others still armed offensively and defensively with bones and spines, as the Shield Orb.

Of these scarce one is without its peculiar weapon of offence. The centriscus wounds with its spine; the ostracion poisons with its venom; the orb is impregnable, and is absolutely poisonous if eaten. Indeed their figure is not such as would tempt one to make the experiment; and the natives of those countries where they are found are careful to inform foreigners of their danger; yet a certain sailor at the Cape of Good Hope, not believing what the Dutch told him concerning their venom, was resolved to make the experiment, and break through a prejudice which, he supposed, was founded on the animal's deformity. He tried and ate one; but his rashness cost him his life; he instantly fell sick, and died a few days after.

These frightful animals are of different sizes; some not bigger than a football, and others as large as a bushel. They almost all flatten and erect their spines at pleasure, and increase the terrors of their appearance in proportion to the approach of danger. At first they seem more inoffensive; their body oblong, with all their weapons pointing towards the tail; but, upon being provoked or alarmed, the body that before seemed small, swells to the view; the animal visibly grows rounder and larger, and all its prickles stand upright, and threaten the invader on every side. The Americans often amuse themselves with the barren pleasure of catching these frightful creatures by a line and hook, baited with a piece of sea-crab. The animal approaches the bait with its spines flattened; but when hooked and stopped by the line, straight all its spines are erected; the whole body being armed in such a manner at all points, that it is impossible to lay hold of it on any part. For this reason it is dragged

Flounder, p. 238.

Turbot, p. 287.



Barbel, p. 297.

Sucking Fish, p. 287

To face p. 280, vol. iii.

to some distance from the water, and there it quickly expires. In the middle of the belly of all these there is a sort of bag or bladder filled with air, and by the inflation of which the animal swells itself in the manner already mentioned.

In describing the deformed animals of this class, one is sometimes at a loss whether it be a fish or an insect that lies before him. Thus the hippocampus and the pipe-fish bear a strong resemblance to the caterpillar and the worm; while the lesser orb bears some likeness to the class of sea-eggs to be described after. I will conclude this account of cartilaginous fishes with the description of an animal which I would scarcely call a fish, but that Father Labat dignifies it with the name. Indeed, this class teems with such a number of odd-shaped animals, that one is prompted to rank every thing extraordinary of the finny species among the number; but besides, Labat says, its bones are cartilaginous, and that may entitle it to a place here.

The animal I mean is the Galley Fish, which Linnæus degrades into the insect tribe, under the title of *the Medusa*, but which I choose to place in this tribe, from its habits, which are somewhat similar. To the eye of an unmindful spectator, this fish seems a transparent bubble swimming on the surface of the sea, or like a bladder variously and beautifully painted with vivid colours, where red and violet predominate, as variously opposed to the beams of the sun. It is, however, an actual fish; the body of which is composed of cartilages, and a very thin skin filled with air, which thus keeps the animal floating on the surface as the waves and the winds happen to drive. Sometimes it is seen thrown on the shore by one wave, and again washed back into the sea by another. Persons who happen to be walking along the shore often happen to tread upon these animals; and the bursting of their body yields a report like that when one treads upon the swim of a fish. It has eight broad feet with which it swims, or which it expands to catch the air as with a sail. It fastens itself to whatever it meets by means of its legs, which have an adhesive quality. Whether they move when on shore, Labat could never perceive, though he did every thing to make them stir; he only saw that it strongly adhered to whatever substances he applied it. It is very common in America, and grows to the size of a goose-egg, or somewhat more. It is perpetually seen floating; and no efforts that are used to hurt it can sink it to the bottom. All that appears above water is a bladder clear and transparent as glass, and shining with the most beautiful colours of the rainbow. Beneath, in the water, are four of the feet already mentioned that serve as oars, while the other four are expanded above to sail with. But what is most remarkable in this extraordinary creature is, the violent pungency of the slimy substance with which its legs are smeared. If the smallest quantity but touch the skin, so caustic is its quality, that it burns it like hot oil dropped on the part affected. The pain is worst in the heat of the day, but ceases in the cool of the evening. It is from feeding on these that he thinks the poisonous quality contracted by some West Indian fish may be accounted for. It is certain these animals are extremely common along all the coasts in the Gulf of Mexico; and whenever the shore is covered with them in an unusual manner, it is considered as a certain forerunner of a storm.

BOOK III.

OF SPINOUS FISHES.

CHAPTER I.

THE DIVISION OF SPINOUS FISHES.

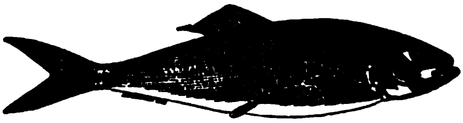
THE third general division of fishes is into that of the spinous or bony kind. These are obviously distinguished from the rest by having a complete bony covering to their gills, by their being furnished with no other method of breathing but gills only; by their bones, which are sharp and thorny; and their tails, which are placed in a situation perpendicular to the body. This is that class which alone our later naturalists are willing to admit as fishes. The cetaceous class, with them, are but beasts that have taken up their abode in the ocean; the cartilaginous class are an amphibious band, that are but half denizens of that element; it is fishes of the spinous kind that really deserve the appellation.

This distinction the generality of mankind will hardly allow; but whatever be the justice of this preference in favour of the spinous class, it is certain that the cetaceous and cartilaginous classes bear no proportion to them in number. Of the spinous classes are already known above four hundred species; so that the number of the former are trifling in comparison, and make not above a fifth part of the finny creation.

From the great variety in this class, it is obvious how difficult a task it must have been to describe or remember even a part of what it contains. When six hundred different sorts of animals offer themselves to consideration, the mind is bewildered in the multiplicity of objects that all lay some claim to its attention. To obviate this confusion, systems have been devised, which, throwing several fishes that agree in many particulars into one group, and thus uniting all into so many particular bodies, the mind that was incapable of separately considering each, is enabled to comprehend all when thus offered in larger masses to its consideration.

Indeed, of all the beings in Animated Nature, fishes most demand a systematical arrangement. Quadrupeds are but few, and can be all known; birds, from their seldom varying in their size, can be very tolerably distinguished without system; but among fishes, which no size can discriminate, where the animal ten inches, and the animal ten feet long, is entirely the same, there must be some other criterion

Common Eel, p. 287.



Dace, p. 285.

Sea Worm, vol. i., p. 168.

Horned Silure, p. 286.

Chaetodon, p. 285.

To face p. 282, vol. iii.

by which they are to be distinguished; something that gives precision to our ideas of the animal whose history we desire to know.

Of the real history of fishes, very little is yet known; but of very many we have full and sufficient accounts, as to their external form. It would be unpardonable, therefore, in a history of these animals, not to give the little we do know; and, at least arrange our forces, though we cannot tell their destination. In this art of arrangement, Artedi and Linnæus have long been conspicuous: they have both taken a view of the animal's form in different lights; and, from the parts which most struck them, have founded their respective systems.

Artedi, who was foremost, perceiving that some fishes had hard, prickly fins, as the pike; that others had soft, pliant ones, as the herring; and that others still wanted that particular fin, by which the gills are opened and shut, as the eel, made out a system from these varieties. Linnæus, on the other hand, rejecting this system, which he found liable to too many exceptions, considered the fins, not with regard to their substance, but their position. The ventral fins seem to be the great object of his system; he considers them in fishes supplying the same offices as feet in quadrupeds; and from their total absence, or from their being situated nearer the head or the tail, in different fishes, he takes the differences of his system.

These arrangements, which are totally arbitrary, and which are rather a method than a science, are always fluctuating; and the last is generally preferred to that which went before. There has lately appeared, however, a system composed by Mr. Gouan of Montpelier, that deserves applause for more than its novelty. It appears to me the best arrangement of this kind that ever was made; and in it the divisions are not only precisely systematical, but, in some measure, adopted by Nature itself. This learned Frenchman has united the systems of Artedi and Linnæus together; and, by bringing one to correct the other, has made out a number of tribes, that are marked with the utmost precision. A part of his system, however, we have already gone through, in the cartilaginous, or, as he calls a part of them, the *branchiostegous* tribe of fishes. In the arrangement of these, I have followed Linnæus, as the number of them was but small, and his method simple. But in that which is more properly called the *spinous class of fishes*, I will follow Mr. Gouan's system; the terms of which, as well as of all the former systems, require some explanation. I do not love to multiply the technical terms of a science; but it often happens that names, by being long used, are as necessary to be known as the science itself.

If we consider the substance of the fin of a fish, we shall find i composed, besides the skin, either of straight, hard, pointed, bony prickles or spines, as in the pike; or of soft, crooked, or forked bones, or cartilages, as in the herring. The fish that have bony, prickly fins, are called *prickly-finned fish*; the latter, that have soft or cartilaginous fins, are called *soft-finned fish*. The prickly-finned fish have received the Greek new-formed name of *Acanthopterigii*: the soft finned fish have likewise their barbarous Greek name of *Malacopterigii*. Thus far Artedi has supplied Mr. Gouan with names and divisions. All spinous fish are divided into prickly-finned fish and soft-finned fish.

Again, Linnæus has taught him to remark the situation of the fins for the ventral or belly-fins, which are those particularly to be remarked, are either wholly wanting, as in the eel, and then the fish is called *Apodal* (a Greek word signifying without feet;) or the ventral-fins are placed more forward than the pectoral-fins, as in the haddock and then the animal is called a *Jugular-fish;* or the ventral-fins are placed directly under the pectoral-fins, as in the father-lasher, and then it is called a *Thoracic-fish:* or, lastly, the ventral-fins are placed nearer the tail than the pectoral-fins, as in the minnow, and then it is an *Abdominal-fish.*

Possessed of these distributions, the French naturalist mixes and unites them into two grand divisions. All the prickly-finned fish make one general division; all the soft-finned fish another. Those first are distinguished from each other, as being either *apodal, jugular, thoracic,* or *abdominal.* Thus there are prickly-finned *apodal* fishes; prickly-finned *jugular* fishes, prickly-finned *thoracic* fishes, and prickly-finned *abdominal* fishes. On the other hand, the soft-finned fishes fall under a similar distribution, and make the other general division. Thus there are soft-finned *apodal* fishes, soft-finned *jugular* fishes, soft-finned *thoracic* fishes, and soft-finned *abdominal* fishes. These general characters are strongly marked, and easily remembered. It only remains, therefore, to divide these into such tribes as are most strongly marked by Nature; and to give the distinct character of each, to form a complete system with great simplicity. This Mr Gouan has done; and the tribes into which he has distributed each of these divisions, exactly amount to fifty. Thus the reader, who can contain in his memory the characteristic marks of fifty kinds, will have a tolerable idea of the form of every kind of spinous fish. I say, of the form; for as to the history and nature of the animal itself, that can only be obtained by experience and information.

SECTION I.

PRICKLY-FINNED FISHES.

Prickly-finned Apodal Fish.

1. THE *Trichurus.* The body of a sword-form; the head oblong; the teeth sword-like, bearded near the points; the fore-teeth largest; the fin that covers the gills with seven spines; the tail ending in a a point without fins; an inhabitant near the orienial and American shores; of a silvery white; frequently leaping into the fishermen's boats in China.

2. The *Xiphias* or *Sword-fish.* The body round: the head long; the upper jaw terminating by a long beak, in form of a sword; the fin that covers the gills with six spines; an inhabitant of Europe, an enemy to the whale.

3. The *Ophidium* or *Gilt-head.* The body sword-like; the head blunt; the fin covering the gills with seven spines; the opening of the mouth side-ways; the fins of the back, the anus, and the tail all joining together; the most beautiful of all fishes, covered over with

green, gold, and silver; it is by sailors called the dolphin, and gives chase to the flying-fish.

Prickly-finned Jugular Fish.

4. The *Trachinous* or *Weaver*. The body oblong; the head obtuse; the bones covering the gills jagged at the bottom; the fins covering the gills with six spines; the anus near the breast; buries itself in the sands, leaving only its nose out; and if trod upon, immediately strikes with the spines that form its dorsal fins, which are venomous and dangerous.

5. The *Uranoscopus*. The body wedge-like: the head almost round, and larger than the body; the mouth flat; the eyes on the top of the head; the fin covering the gills with five spines: the anus in the middle of the body; an inhabitant of the Mediterranean Sea.

6 The *Caliyonomus* or *Dragonet*. The body almost wedge-like; the head broad, and larger than the body; the mouth even with the body; the bony covering of the gills close shut; the opening to the gills behind the head; the fin covering the gills with six spines, an inhabitant of the Atlantic Ocean.

7. The *Blennius* or *Blenny*. The body oblong; the head obtusely bevel; the teeth a single range; the fin covering the gills with six spines; the ventral fins have two small blunt bones in each; a species of this animal is viviparous.

Prickly-finned Thoracic Fishes.

8. The *Gobius* or *Gudgeon*. The body round and oblong; the head with two little holes between the eyes, one before the other, the fin covering the gills with six spines; the ventral fins joined together.

9. The *Cepola*. The body sword-like; the head blunt; the mouth flat; the fin covering the gills with six spines; the fins distinct; an inhabitant of the Mediterranean Sea.

10. The *Coryphæna* or *Razor-fish*. The body wedge-like: the head very bevel; the fin covering the gills with five spines.

11. The *Scomber* or *Mackarel*. The body oblong; the line running down the side zigzagged towards the tail: the head sharp and small; the fins covering the gills with six spines; several false fins towards the tail.

12. The *Labrus* or *Wrasse*. The body oval; the head middling; the lips doubled inward; both cutting and grinding-teeth; the covers of the gills scaly; the fin covering the gills with five spines; the pectoral fins pointed.

13. The *Saprus* or *Sea-bream*. The body oblong; the head middling; the lips not inverted; the teeth cutting and grinding; the cover of the gills scaly; the fins covering the gills with five rays; the pectoral fins pointed.

14. The *Chætodon* or *Cat-fish*. The body oblong; the head small, the teeth slender and bending; the fin covering the gills with five or six spines; the fin of the back and anus scaly.

15. The *Sciæna* The body nearly elliptical; the head bevel, the

covers of the fins scaly; the fin covering the gills with six rays, the fins of the back jagged, and hidden in a furrow in the back.

16. The *Perch.* The body oblong; the head bevel; the covers of the gills scaly and toothed; the fin covering the gills with seven spines; the fins in some jagged.

17. The *Scorpæna* or *Father-lasher.* The body oblong; the head great, with beards; the covers of the gills armed with prickles; the fin covering the gills with seven spines.

18. The *Mullus* or *Surmulet.* The body slender; the head almost four-cornered; the fin covering the gills with three spines; some of these have beards; a fish highly prized by the Romans, and still considered as a very great delicacy.

19. The *Trigla* or the *Gurnard.* The body slender; the head nearly four-cornered, and covered with a bony coat, the fin covering the gills with seven spines; the pectoral and ventral fins, strengthened with additional muscles and bones, and very large for the animal's size.

20. The *Cottus* or *Bull-head.* The body wedge-like; the head flat and broader than the body; the fin covering the gills with six spines; the head furnished with prickles, knobs, and beards.

21. The *Zeus* or *Doree.* The body oblong; the head bevel; the fin covering the gills with seven rays; the fins jagged, the upper jaw with a loose floating skin depending into the mouth.

22. The *Thrachipterus* or *Sabre.* The body sword-like; the head bevel; the fin covering the gills with six spines; the lateral line straight; the scales in a single order; a loose skin in both the jaws.

23. The *Gasterosteus* or *Stickleback.* The body broadest towards the tail; the head oblong; the fin covering the gills with three spines; prickles starting backward before the back fins and the fins of the anus.

Prickly-finned Abdominal Fish.

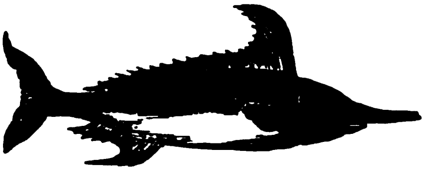
24. The *Silurus* or *Sheat Fish.* The body oblong; the head large; the fin covering the gills from four to fourteen spines; the leading bones or spines in the back and pectoral fins toothed.

25. The *Mugil* or *Mullet.* The body oblong; the head almost conical; the upper jaw with a furrow, which receives the prominence of the under; the fin covering the gills with seven rays.

26. The *Polynemus.* The body oblong; the head with a beak, the fin covering the gills with from five to seven spines; the bones that move the pectoral fins not articulated to those fins.

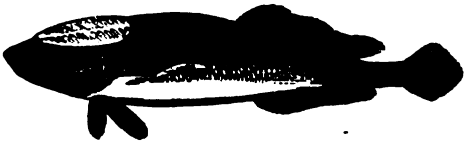
27. The *Teuthys.* The body almost elliptical; the head abruptly shortened; the fin covering the gills with five rays; the teeth in a single row, close, strong, and even.

28. The *Elops* or *Sea Serpent.* The body slender; the head large; the fin covering the gills double, with thirty spines, and armed externally with five bones resembling teeth

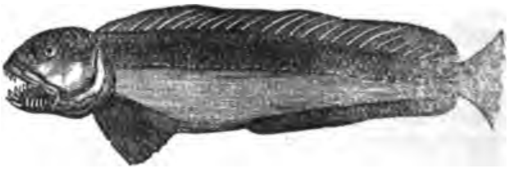


Swordfish, p. 284.

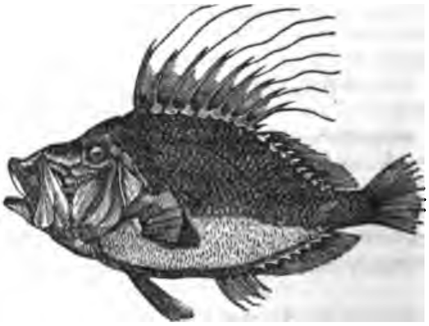
Cod, p. 287.



Remora, p. 283.



Wolf Fish, p. 287.



John Doree, p. 286.

To face p 287, vol. iii.

SECTION II.

SOFT-FINNED FISHES.

Soft-finned Apodal Fishes.

29. The *Muræna* or *Eel.* The body round and slender; the head terminating in a beak; the fin covering the gills with ten rays; the opening to the gills pipe-fashion, placed near the pectoral fins; the fins of the back, the anus, and the tail, united in one.

30. The *Gymnotus* or *Carapo.* The body broadest on the back; like the blade of a knife; the head small; the fin covering the gills with five rays; the back without a fin; two beards or filaments from the upper lip; an inhabitant of Brazil.

31. The *Anarchicas* or *Wolf-fish.* The body roundish and slender; the head large and blunt; the fore-teeth above and below conical; the grinding-teeth and those in the palate round; the fin covering the gill has six rays.

32. The *Stromateus.* The body oblong; the head small; the teeth moderately sharp; the fin covering the gills with five or six rays.

33. The *Ammodytes* or *Launce.* The body slender and roundish; the head terminated by a beak; the teeth of a hair-like fineness; the fin covering the gills with seven rays.

Soft-finned Jugular Fishes.

34. The *Lepadogaster.* The body wedge-like; the head oblong; forwarder than the body, flattish, the beak resembling that of a duck; the pectoral fins double, two on each side; the ventral fins joined together; a kind of bony breastplate between the pectoral fins; the fin covering the gills with five rays; the opening to the gills pipe-fashion.

35. The *Gadus* or *Cod Fish.* The body oblong; the head wedge-like; the fin covering the gills with seven rays; several back and anal fins.

Soft-finned Thoracic Fishes.

36. The *Pleuronectes* or *Flounders.* The body elliptical; the head small; both eyes on one side of the head; the fin covering the gills with from four to seven rays.

37. The *Echineis* or *Sucking-fish.* The body almost wedge-like; moderately round; the head broader than the body; the fin covering the gill with ten rays; an oval breastplate, streaked in form of a ladder, toothed.

38. The *Lepidopus* or *Garter-fish.* The body sword-like; the head lengthened out; the fins covering the gills with seven rays; three scales only on the whole body; two in the place of the ventral fins; the third from that of the anus.

Soft-finned Abdominal Fish.

39. The *Loricaria.* The body crusted over; the head broad with a beak; no teeth; the fin covering the gills with six rays.

40. The *Atherina* or *Atherine.* The body oblong; the head of a middling size; the lips indented; the fin covering the gills with six rays; the line on the sides resembling a silver band.

41. The *Salmo* or *Salmon.* The body oblong; the head a little sharp; the fin covering the gills from four to ten rays; the last fin on the back, without its correspondent muscle: fat.

42. The *Fistularia.* The body angular, in form of a spindle; the head pipe-fashion, with a beak; the fin covering the gills with seven rays; the under jaw covering the upper.

43. The *Esox* or *Pike.* The body round; the head with a beak; the under jaw pierced longitudinally with small holes; the fin covering the gills with from seven to twelve rays.

44. The *Argentina* or *Argentine.* The body a little round and slender; the head with a beak, broader than the body; the fin covering the gills with eight rays; a spurious back fin.

45. The *Clupea* or *Herring.* The body a little oblong; the head with a small beak; the fin covering the gills with eight rays.

46. The *Exocetas* or *Flying-fish.* The body oblong; the head almost three-cornered; the fin covering the gills with ten rays; the pectoral fins placed high, and as long as the whole body; the back fin at the extremity of the back.

47. The *Cyprinus* or *Carp.* The body elongated, almost round; the head with a small beak; the hinder part of the bone covering the gills, marked with a crescent; the fin covering the gills with three rays.

48. The *Cobitis* or *Loach.* The body oblong: almost equally broad throughout; the head small, a little elongated; the eyes in the hinder part of the head; the fin covering the gills from four to six rays; the covers of the gills closed below.

49. The *Amia* or *Bonito.* The body round and slender; the head, forehead, and breast, without skin; the fin covering the gills with twelve rays; two beards from the nose.

50. The *Mormyrus.* The body oblong; the head elongated; the fin covering the gills with a single ray; the opening to the gills is linear, and has no bone covering them.

Such is the system of Mr. Gouan; by reducing to which any fish that offers, we can know its rank, its affinities, and partly its anatomy, all which make a considerable part in its natural history. But, to show the use of this system still more apparently, suppose I meet with a fish, the name to me unknown, of which I desire to know something more. The way is first to see whether it be a cartilaginous fish, which may be known by its wanting fins to open and shut the gills, which the cartilaginous kinds are wholly without. If I find that it has them, then it is a spinous fish; and in order to know its kind I examine its fins, whether they be prickly or soft: I find them soft; it is therefore to be ranked among the soft-finned fishes. I then examine its ventral or belly fins, and finding that the fish has them, I look for their situation, and find they lie nearer to the tail than the pectoral fins. By this I find the animal to be a soft-finned abdominal fish. Then to know which of the kinds of these fishes it is, I examine its figure and the shape of its head, I find the body rather oblong; the head with a small beak; the lower jaw like a saw; the fin covering the gills with eight rays. This animal must therefore be the herring, or one of that family, such as the pilchard, the sprat, the shad, or the anchovy. To give another instance: Upon examining the fins of a fish to me unknown, I find them prickly; I then look for the situation of the ventral fins, I find them entirely wanting; this then must be a prickly-finned apodal fish. Of this kind there are but three; and by comparing the fish with the description, I find it either of the trichurus kind, the sword-fish, or the gilt-head. Upon examining also its internal structure, I shall find a very great similitude between my fish and that placed at the head of the family.

CHAPTER II.

OF SPINOUS FISHES IN GENERAL.

HAVING given a method by which Spinous Fishes may be distinguished from each other, the history of each in particular might naturally be expected to follow; but such a distinct account of each would be very disgusting, from the unavoidable uniformity of every description. The history of any one of this class very much resembles that of all the rest: they breathe air and water through the gills; they live by rapine, each devouring such animals as its mouth is capable of admitting; and they propagate, not by bringing forth their young alive, as in the cetaceous tribes, nor by distinct eggs, as in the generality of the cartilaginous tribes, but by spawn, or peas, as they are generally called, which they produce by hundreds of thousands. These are the leading marks that run through their whole history, and which have so much swelled books with tiresome repetition.

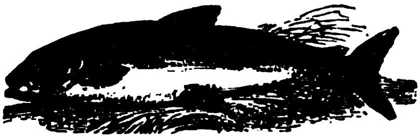
It will be sufficient therefore to draw this numerous class into one point of view, and to mark how they differ from the former classes; and what they possess peculiarly striking, so as to distinguish them from each other. The first object that presents itself, and that by which they differ from all others, is the bones. These, when examined but slightly, appear to be entirely solid; yet, when viewed more closely, every bone would be found hollow, and filled with a substance less rancid and oily than marrow. These bones are very numerous, and pointed; and, as in quadrupeds, are props or stays to which the muscles are fixed which move the different parts of the body

The number of bones in all spinous fishes of the same kind, is always the same It is a vulgar way of speaking to say, that fishes are at some seasons more bony than at others; but this scarce requires contradiction. It is true indeed, that fish are at some seasons much fatter than at others; so that the quantity of the flesh being diminished, and that of the bones remaining the same, they appear to increase in number, as they actually bear a greater proportion.

All fish of the same kind, as was said, have the same number of bones: the skeleton of a fish, however irregularly the bones may fall in our way at table, has its members very regularly disposed; and every bone has its fixed place, with as much precision as we find in the orders of a regular fabric. But then spinous fish differ in the number of bones according to the species; for some have a greater number of fins by which they move in the water. The number in each is always in proportion to the number and size of these fins: for every fish has a regular apparatus of bones and muscles, by which the fins are moved; and all these fish where they are numerous or large, must, of consequence, be considerably bony. Indeed, in the larger fish, the quantity of flesh is so much, and the bones themselves are so large, that they are easily seen and separated; but in the smaller kinds with many fins, the bones are as numerous as in the great; yet being so very minute, they lurk in almost every part of the flesh, and are dangerous as well as troublesome to be eaten. In a word, those fish which are large, fat, and have few fins, are found to be the least bony; those which are small, lean, and have many fins, are the most bony of all others. Thus, for instance, a roach appears more bony than a carp, because it is leaner and smaller; and it is actually more bony than an eel, because it has a greater number of fins.

As the spinous fish partake less of the quadruped in their formation than any others, so they can bear to live out of their own element a shorter time. In general, when taken out of the water, they testify their change by panting most violently and at closer intervals, the thin air not furnishing their gills the proper play; and in a few minutes they expire. Some indeed are more vivacious in air than others; the eel will live several hours out of water; and the carp has been known to be fattened in a damp cellar. The method is by placing it in a net well wrapped up in wet moss, the mouth only out, and then hung up in a vault. The fish is fed with white bread and milk; and the net now and then plunged into the water. The animal, thus managed, has been known not only to live for a fortnight, but to grow exceedingly fat and of a superior flavour. From this it would seem that the want of moisture in the gills, is the chief cause of the death of these animals; and could that be supplied, their lives might be prolonged in the air almost as well as in their own element.

Yet it is impossible to account for the different operations of the same element upon animals, that, to appearance, have the same conformation. To some fishes, bred in the sea, fresh water is instant destruction: on the other hand, some fishes, that live in our lakes and ponds, cannot bear the salt water. Whence this difference can arise, is not easily to be accounted for. The saline quality of the water cannot properly be given as the cause; since no fishes imbibe any of the sea's saltness with their food, or in respiration. The flesh of all fishes is equally fresh, both in the river, and in the saltest depths of



Salmon, p. 288.

Mackerel, p. 285.

Trout, p. 286.

Flying Fish, p. 288.

To face p. 290. vol. iii.

the ocean; the salt of the element in which they live noway mixing with their constitution. Whence then is it that animals will live only there, and will quickly expire, when carried into fresh water? It may probably arise from the superior weight of the sea water; as from the great quantity of salt dissolved in its composition, it is much heavier than fresh water, so it is probable it lies with greater force upon the organs of respiration, and gives them their proper and necessary play: on the other hand, those fish which are used only to fresh water, cannot bear the weight of the saline fluid, and expire, in a manner suffocated in the grossness of the strange element.

But though there are some tribes that live only in the sea, and others in fresh water, yet there are some whose organs are equally adapted to either element; and that spend a part of their season in one, and a part in the other. Thus the salmon, the shad, the smelt, and the flounder, annually quit their native ocean, and come up our rivers to deposit their spawn. This seems the most important business of their lives; and there is no danger which they will not encounter, even to the surmounting precipices, to find a proper place for the deposition of their future offspring. The salmon, upon these occasions, is seen to ascend rivers five hundred miles from the sea; and to brave not only the danger of various enemies, but also to spring up cataracts as high as a house. As soon as they come to the bottom of the torrent, they seem disappointed to meet the obstruction, and swim some paces back: they then take a view of the danger that lies before them, survey it motionless for some minutes, advance, and again retreat; till at last summoning up all their force, they take a leap from the bottom, their body straight, and strongly in motion; and thus most frequently clear every obstruction. It sometimes happens, however, that they want strength to make the leap; and then, in our fisheries, they are taken in their descent. But this is one of the smallest dangers that attend these adventuring animals in their progress: numberless are the methods of taking them; as well by the hook, as by nets, baskets, and other inventions, which it is not our business here to describe. Their capture makes, in several countries, a great article of commerce; and being cured in several different manners, either by salting, pickling, or drying, they are sent to all the markets of Europe.

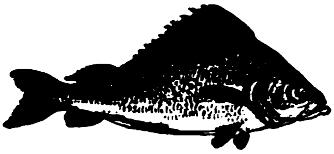
As these mount up the rivers to deposit their spawn, others, particularly the eel, descend the fresh-water stream, as Redi assures us, to bring forth their young in the sea. About the month of August, annually, these animals take the opportunity of the most obscure nights and when the rivers are flooded by accidental rains, seek the ocean. When they have reached the sea, and produced their young, for they are viviparous, they again ascend the stream, at different times, as opportunity offers, or as the season is favourable or tempestuous Their passage begins usually about the end of January, and continues till towards the end of May, when they are taken in the river Arno by millions, and so small that a thousand of them goes to a pound. There is nothing more certain, than that they descend in our own rivers after floods, in great abundance, and are thus caught in nets, to very great advantage. They are also possessed of a power of climbing over every obstacle; for, by applying their glutinous and slimy bodies to the surface of the object they desire to surmount, they can thus creep up locks, weirs, and every thing that would prevent their ascending the current of the stream.

But the length of the voyage performed by these fishes, is sport, if compared to what is annually undertaken by some tribes, that constantly reside in the ocean. These are known to take a course of three or four thousand miles in a season, serving for prey to whales, sharks, and the numerous flocks of water-fowl, that regularly wait to intercept their progress. They may be called fish of passage, and bear a strong analogy to birds of passage, both from their social disposition, and the immensity of their numbers. Of this kind are the cod, the haddock, the whiting, the mackarel, the tunny, the herring, and the pilchard. Other fish live in our vicinity, and reside on our coasts all the year round; or keep in the depths of the ocean, and are but seldom seen: but these, at stated seasons, visit their accustomed haunts with regular certainty, generally returning the same week in the succeeding year, and often the same day.

The stated returns, and the regular progress of these fish of passage, is one of the most extraodinary circumstances in the History of Nature. What it is that impels them to such distant voyages, what directs their passage; and what supports them by the way; and what sometimes prompts them to quit, for several seasons, one shore for another, and then return to their accustomed harbour, are questions that Curiosity may ask, but Philosophy can hardly resolve. We must dismiss inquiry, satisfied with the certainty of the facts.

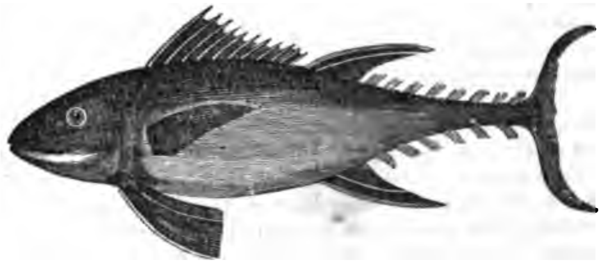
The cod seems to be the foremost of this wandering tribe, and is only found in our northern part of the world. This animal's chief place of resort is on the banks of Newfoundland, and the other sandbanks that lie off Cape Breton. That extensive flat seems to be no other than the broad top of a sea-mountain, extending for above five hundred miles long, and surrounded with a deeper sea. Hither the cod annually repair in numbers beyond the power of calculation, to feed on the quantity of worms that are to be found there in the sandy bottom. Here they are taken in such quantities, that they supply all Europe with a considerable share of provision. The English have stages erected all along the shore for salting and drying them; and the fishermen, who take them with the hook and line, which is their method, draw them in as fast as they can throw out. This immense capture, however, makes but a very small diminution, when compared to their numbers; and when their provision there is exhausted, or the season for propagation returns, they go off to the polar seas, where they deposit their roes in full security. From thence want of food forces them, as soon as the first more southern seas are open, to repair southward for subsistence. Nor is this fish an unfrequent visitant upon our own shores; but the returns are not so regular, nor does the capture bear any proportion to that at Newfoundland.

The haddock, the whiting, and the mackarel, are thought by some to be driven upon our coasts rather by their fears than their appetites; and it is to the pursuit of the larger fishes we owe their welcome visits. It is much more probable, that they come for that food which is found in more plenty near the shore than farther out at sea. One thing is remarkable that their migrations seem to be regularly conducted.



Perch, p. 286.

Bream, p. 286.



Tunny, p. 287.

To face p. 282, vol. iii.

The grand shoal of haddocks that comes periodically on the Yorkshire coasts, appeared there in a body on the tenth of December, 1766; and exactly on the same day in the following year. This shoal extended from the shore near three miles in breadth, and in length for more than forty. The limits of a shoal are precisely known; for if the fishermen put down their lines at the distance of more than three miles from shore, they catch nothing but dog-fish: a proof that the haddock is not there.

But of all migrating fish, the herring and the pilchard take the most adventurous voyages. Herrings are found in the greatest abundance in the highest northern latitudes. In these inaccessible seas, that are covered with ice for a great part of the year, the herring and pilchard find a quiet and sure retreat from all their numerous enemies: thither neither man, nor their still more destructive enemy, the fin-fish, or the cachalot, dares to pursue them. The quantity of insect food which those seas supply, is very great; whence, in that remote situation, defended by the icy rigour of the climate, they live at ease, and multiply beyond expression. From this most desirable retreat, Anderson supposes, they would never depart, but that their numbers render it necessary for them to migrate; and as bees from a hive, they are compelled to seek for other retreats.

For this reason, the great colony is seen to set out from the icy sea about the middle of winter; composed of numbers, that if all the men in the world were to be loaded with herrings, they would not carry the thousandth part away. But they no sooner leave their retreats, but millions of enemies appear to thin their squadrons. The fin-fish and cachalot swallow barrels at a yawn; the porpoise, the grampus, the shark, and the whole numerous tribe of dog-fish, find them an easy prey, and desist from making war upon each other: but, still more, the unnumbered flocks of sea-fowl, that chiefly inhabit near the pole, watch the outset of their dangerous migration, and spread extensive ruin.

In this exigence the defenceless emigrants find no other safety but by crowding closer together, and leaving to the outmost bands the danger of being the first devoured; thus, like sheep when frighted, that always run together in a body, and each finding some protection in being but one of many that are equally liable to invasion, they are seen to separate into shoals, one body of which moves to the west, and pours down along the coasts of America, as far south as Carolina, and but seldom farther. In Chesapeak Bay, the annual inundation of these fish is so great, that they cover the shores in such quantities as to become a nuisance. Those that hold more to the east, and come down towards Europe, endeavour to save themselves from their merciless pursuers, by approaching the first shore they can find; and that which first offers in their descent, is the coast of Iceland, in the beginning of March. Upon their arrival on that coast, their phalanx, which has already suffered considerable diminutions, is, nevertheless, of amazing extent, depth, and closeness, covering an extent of shore as large as the island itself. The whole water seems alive; and is seen so black with them to a great distance, that the number seems inexhaustible. There the porpoise and the shark continue their depredations; and the birds devour what quantities they please. By these enemies the herrings are cooped up into so close a body, that a shovel, or any hollow vessel put into the water, takes them up without farther trouble.

That body which comes upon our coasts, begins to appear off the Shetland Isles in April. These are the forerunners of the grand shoal which descends in June; while its arrival is easily announced, by the number of its greedy attendants, the gannet, the gull, the shark, and the porpoise. When the main body is arrived, its breadth and depth is such as to alter the very appearance of the ocean. It is divided into distinct columns, of five or six miles in length, and three or four broad; while the water before them curls up, as if forced out of its bed. Sometimes they sink for the space of ten or fifteen minutes, then rise again to the surface; and, in bright weather, reflect a variety of splendid colours, like a field bespangled with purple, gold, and azure. The fishermen are ready prepared to give them a proper reception; and by nets made for the occasion, they take sometimes above two thousand barrels at a single draught.

From the Shetland Isles, another body of this great army, where it divides, goes off to the western coasts of Ireland, where they meet with a second necessity of dividing. The one takes the Atlantic, where it is soon lost in that extensive ocean, the other passes into the Irish sea, and furnishes a very considerable capture to the natives.

In this manner, the herrings, expelled from their native seas, seek those bays and shores where they can find food, and the best defence against their unmerciful pursuers of the deep. In general, the most inhabited shores are the places where the larger animals of the deep are least fond of pursuing; and these are chosen by the herring as an asylum from greater dangers. Thus, along the coasts of Norway, the German shores, and the northern shores of France, these animals are found punctual in their visitations. In these different places they produce their young; which, when come to some degree of maturity, attend the general motions. After the destruction of such numbers, the quantity that attempts to return is but small; and Anderson doubts whether they ever return.

Such is the account given of the migration of these fishes, by one who, of all others, was best acquainted with their history; and yet many doubts arise, in every part of the migration. The most obvious which has been made is, that though such numbers perish in their descent from the north, yet, in comparison to those that survive, the account is trifling: and it is supposed, that of those taken by man, the proportion is not one to a million. Their regularly leaving the shore also at a stated time, would imply that they are not in their visits under the impulse of necessity. In fact, there seems one circumstance that shows these animals governed by a choice with respect to the shores they pitch upon; and not blindly drove from one shore to another. What I mean is, their fixing upon some shores for several seasons, or indeed, for several ages together; and, after having regularly visited them every year, then capriciously forsaking them, never more to return. The first great bank for herrings was along the shores of Norway. Before the year 1584, the number of ships from all parts of Europe that resorted to that shore, exceeded some thousands. The quantity of herrings that were then assembled there was such, that a man who should put a spear in the water, as Olaus Magnus asserts, would see it stand on end, being prevented from falling. But soon after that period, these animals were seen to desert the Norway shores, and took up along the German coast, where the Hanse-Towns drove a very great trade by their capture and sale; but, for above a century, the herrings have, in a great measure, forsaken them; and their greatest colonies are seen in the British Channel, and upon the Irish shores. It is not easy to assign a cause for this seemingly capricious desertion; whether the number of their finny enemies increasing along the northern coasts, may have terrified the herring tribe from their former places of resort; or, whether the quantity of food being greater in the British Channel, may not allure them thither, is not easy to determine!

The pilchard, which is a fish differing little from the herring, makes the coast of Cornwall its place of principal resort. Their arrival on that coast is soon proclaimed by their attendants the birds, and the larger fishes; and the whole country prepare to take the advantage of this treasure, providentially thrown before them. The natives sometimes enclose a bay of several miles extent with their nets called *seines*. To direct them in their operations, there were some years ago (but I believe they are discontinued) several men placed on eminences near the shore, called *huers*, who, with brooms in their hands, gave signals where the nets were to be extended, and where the shoals of fishes lay: this they perceived by the colour of the water, which assumed a tincture from the shoals beneath. By these means, they sometimes take twelve or fifteen hundred barrels of pilchards at a draught; and they place them in heaps on the shore. It often happens, that the quantity caught exceeds the salt or the utensils for curing them; and then they are carried off to serve for the purposes of manure. This fishery employs not only great numbers of men at sea, training them to naval affairs, but also numbers of women and children at land, in salting and curing the fish; in making boats, nets, ropes, and casks, for the purposes of taking or fitting them for sale. The poor are fed with the superfluity of the capture; the land is manured with the offals: the merchant finds the gain of commission, and honest commerce; the fisherman a comfortable subsistence from his toil. "Ships," says Dr. Borlase, "are often freighted hither with salt, and into foreign countries with the fish, carrying off at the same time a part of our tin. The usual produce of the number of hogsheads exported for ten years, from 1747 to 1756 inclusive, amounted to near thirty thousand hogsheads each year; every hogshead has amounted, upon an average, to the price of one pound thirteen shillings and threepence. Thus the money paid for pilchards exported, has annually amounted to near fifty thousand pounds."

Whence these infinite numbers are derived, still remains obscure; but it will increase our wonder to be told, that so small a fish as the stickleback, which is seldom above two inches long, and that one would think could easily find support in any water, is yet obliged to colonize, and leave its native fens in search of new habitations. Once every seventh or eighth year, amazing shoals of these appear in the river Welland, near Spalding, and come up the stream, forming one great column. They are supposed to be multitudes collected in some of the fens, till overcharged with numbers, they are periodically obliged to migrate. An idea may be had of their numbers, when we are informed, that a man, employed by a farmer to take them, for the purpose of manuring his grounds, has got, for a considerable time, four shillings a day, by selling them at a half-penny a bushel!

Thus we see the amazing propagation of fishes along our own coasts and rivers; but their numbers bear no proportion to the vast quantities found among the islands of the Indian ocean. The inhabitants of these countries are not under the necessity even of providing instruments for fishing; it is but going down to the shore, and there the fish are found in great numbers in the plashes that still continue to have water in them. In some of these places the quantity is so great, that they are left in shoals, on those swamps, dried up by the sun, and their putrefaction contributes to render the country unhealthful.

This power of increasing in these animals exceeds our idea, as it would, in a very short time, outstrip all calculation. A single herring, if suffered to multiply unmolested and undiminished for twenty years, would show a progeny greater in bulk than ten such globes as that we live upon. But happily the balance of Nature is exactly preserved; and their consumption is equal to their fecundity. For this reason we are to consider the porpoise, the shark, or the cod-fish, not in the light of plunderers and rivals, but of benefactors to mankind Without their assistance, the sea would soon become overcharged with the burden of its own productions; and that element, which at present distributes health and plenty to the shore, would but load it with putrefaction.

In the propagation of all fish, some degree of warmth seems absolutely necessary, not only to their preservation, but to the advancement of their posterity. Their spawn is always deposited in those places where the sunbeams may reach them, either at the bottom of shallow shores or floating on the surface in deeper waters. A small degree of heat answers all the purposes of incubation, and the animal issues from the egg in its state of perfect formation, never to undergo any succeeding change.

Yet, still I have some doubts whether most fish come from the egg completely formed. We know that in all the frog tribe, and many of the lizard kind, they are produced from the egg in an imperfect form. The tadpole, or young frog, with its enormous head and slender tail, are well known; a species of the lizard also, which is excluded from the shell without legs, only acquires them by degrees, and not till after some time does it put off its serpent form. It is probable that some kinds of fish in like manner suffer a change; and though it be too inconsiderable to strike the fisherman or the inattentive spectator, yet it makes a very material difference to the naturalist, and would perhaps disarrange his most favourite systems. A slight alteration in the fins or bones that cover the gills would overturn the whole fabric of the most applauded ichthyologist; and yet, as I observed, it is most probable that these minute alterations often take place.

As a proof of this, during the month of July, there appear near Greenwich innumerable shoals of small fishes, which are known to the Londoners by the name of White Bait. It is universally agreed that they are the young of some fish; they are never seen but at this time of the year, and never found to have any roe, a circumstance that proves their not being come to maturity. The quantity is amazing; and the fish that produces them in such numbers must be in plenty, though it is not yet known what that fish is, as they correspond with no other species whatever. They most resemble the smelt in form; and yet they want a fin, which that animal is never without. They cannot be the bleak, as they are never found in other rivers where the bleak breeds in great abundance. It is most probable, therefore, that they are the young of some animal not yet come to their perfect form, and therefore reducible to no present system.

The time that spinous fishes continue in the pea is in proportion to the size of the kind. It is a rule that chiefly holds through Nature, that the larger the animals are, the longer they continue before exclusion. This I say holds generally through all Nature, though it is not easy to assign a cause for so well known a truth. It may probably be, that as all large bodies take a longer time to grow hot than small ones, so the larger the egg, the longer influence of vital warmth it requires to reach through all its recesses, and to unfold the dormant springs that wait to be put into motion.

The manner in which the eggs of fishes are impregnated is wholly unknown. All that obviously offers is, that in ponds the sexes are often seen together among the long grass at the edge of the water; that there they seem to struggle; and that during this time they are in a state of suffering; they grow thin; they lose their appetite, and their flesh becomes flabby, the scales of some grow rough, and they lose their lustre. On the contrary, when the time of coupling is over, their appetite returns; they reassume their natural agility, and their scales become brilliant and beautiful.

Although the usual way with spinous fishes is to produce by spawn; yet there are some, such as the eel and the blenny, that are known to bring forth their young alive. Bowlker, who has written a treatise upon fishing, seems to determine the question relative to the viviparous production of eels, upon the authority of one or two credible witnesses. An eel, opened in the presence of several persons of credit, was found to have an infinite number of little creatures, closely wrapped up together in a lump, about the size of a nutmeg, which being put into a basin of water, soon separated, and swam about: yet still, whether these may not have been worms generated in the animal's body, remains a doubt; for there are scarce any fishes that are not infested with worms in that manner.

With respect to the growth of fishes, it is observed, that among carps, particularly the first year, they grow to about the size of the leaf of a willow-tree; at two years, they are about four inches long They grow but one inch more the third season, which is five inches. Those of four years old are about six inches; and seven after the fifth. From that to eight years old, they are found to be large in proportion to the goodness of the pond, from eight to twelve inches. With regard to sea-fish, the fishermen assure us, that a fish must be six years old before it is fit to be served up at a table. They instance it in the growth of a mackarel. They assure us, that those of a year old are as large as one's finger; that those of two years, are about twice that length; at three and four years, they are that small kind of mackarel that have neither melts nor roes; and between five and six, they are those full-grown fish that are served up at our tables. In the same manner, with regard to flat fishes, they tell us, that the turbot and barbel at one year are about the size of a crown-piece; the second year as large as the palm of one's hand; and at the fifth and sixth year, they are large enough to be served up at table. Thus it appears that fish are a considerable time in coming to their full growth, and that they are a long time in danger of being destroyed before it comes to their turn to be destroyers.*

All fish live upon each other, in some state of their existence. Those with the largest mouths, attack and devour the larger kinds; those whose mouths are less, lie in wait for the smaller fry; and even those chiefly subsist upon spawn. Of those which live in the ocean of the spinous kinds, the Dorado is the most voracious. This is chiefly found in the tropical climates; and is at once the most active, and the most beautiful of the finny region. It is about six feet long; the back all over enamelled with spots of a bluish green and silver; the tail and fins of a gold colour; and all have a brilliancy of tint, that nothing but Nature's pencil can attain to: the eyes are placed on each side of the head, large and beautiful, surrounded with circles of shining gold. In the seas where they are found, these fish are always in motion, and play round ships in full sail, with ease and security: for ever either pursuing or pursued, they are seen continually in a state of warfare; either defending themselves against the shark, or darting after the smaller fishes. Of all others, the Flying-fish most abounds in these seas; and as it is a small animal, seldom growing above the size of a herring, it is chiefly sought by the dorado. Nature has furnished each respectively with the powers of pursuit and evasion. The dorado being above six feet long, yet not thicker than a salmon, and furnished with a full complement of fins, cuts its way through the water with amazing rapidity: on the other hand, the flying-fish is furnished with two pair of fins longer than the body, and these also moved by a stronger set of muscles than any other. This equality of power seems to furnish one of the most entertaining spectacles those seas can exhibit. The efforts to seize on the one side, and the arts of escaping on the other, are perfectly amusing. The dorado is seen, upon this occasion, darting after its prey, which will not leave the water, while it has the advantage of swimming, in the beginning of the chase. But, like a hunted hare, being tired at last, it then has recourse to another expedient for safety, by flight. The long fins, which began to grow useless in the water, are now exerted in a different manner and different direction to that in which they were employed in swimming: by this means, the timid little animal rises from the water, and flutters over its surface, for two or three hundred yards, till the muscles employed in moving the wings, are enfeebled by that particular manner of exertion. By this time, however, they have acquired a fresh power of renewing their efforts in the water, and the animal is capable of proceeding with some velocity by swimming: still, however, the active enemy keeps it in view, and drives it again from the deep; till, at length, the poor little creature is seen to dart to shorter distances, to flutter with greater effort, and to drop down at last into the mouth of its fierce pursuer. But not the dorado alone, all Animated Nature seems combined against this little fish, which seems possessed of double powers, only to be subject to greater dangers. For though it should escape from its enemies of the deep, yet the tropic bird and the albatross are for ever upon the wing to seize it. Thus pursued in either element, it sometimes seeks refuge from a new enemy; and it is not unfrequent for whole shoals of them to fall on shipboard, where they furnish man with an object of useless curiosity.

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* Traitè des Pêches par Monsieur Duhamel. Sect. 3. p. 100.

The warfare in fresh-water is not carried on with such destructive activity; nor are the inhabitants of that element so numerous. It would seem that there is something more favourable to the fecundity of fishes in the ocean, than in an element less impregnated with salt. It has been the opinion of some philosophers, that all fish are natives of that great reservoir; and that only colonies have been sent up rivers, either through accident, or the necessity of procuring subsistence. They have been led to this opinion by the superior fecundity of sea-fish, which breed twenty to one; as well as by their superiority in strength and size, over those of the same kind found in lakes and rivers. This is a matter too remotely speculative to be worth pursuing; but certain it is, that, in fresh-water, fishes seem to abate much of their courage and rapacity; pursue each other with less violence, and seem to be less powerfully actuated by all their appetites. The greediness with which sea-fish devour the bait is prodigious, if compared with the manner they take it in fresh-water. The lines of such fishermen as go off to sea, are coarse, thick, and clumsy, compared to what are used by those who fish at land. Their baits are seldom more than a piece of a fish, or the flesh of some quadruped, stuck on the hook in a bungling manner; and scarce any art is employed to conceal the deception. But it is otherwise in fresh-water; the lines must often be drawn to a hair-like fineness; they must be tinctured of the peculiar colour of the stream; the bait must be formed with the nicest art, and even, if possible, to exceed the perfection of Nature: yet still the fishes approach it with diffidence, and often swim round it with disdain. The cod, on the banks of Newfoundland, the instant the hook, which is only baited with the guts of the animal last taken, is dropped into the water, darts to it at once, and the fishermen have but to pull up as fast as they throw down. But it is otherwise with those who fish in fresh-waters; they must wait whole hours in fruitless expectation; and *the patience of a fisherman* is proverbial among us.

This comparative neglect of food, which is found in all the tribes of fresh-water fishes, renders them less turbulent and less destructive among each other. Of all these the pike is the most active and voracious; and our poets, whose business it is to observe the surface of Nature, have called it the tyrant of the watery plain. In fact, in proportion to its strength and celerity, the pike does some mischief but what are its efforts compared to those of the cachalot or the shark! they resemble the petty depredations of a robber, put in com petition with the ravages of a conqueror! However, the pike will attack every fish less than itself; and it is sometimes seen choaked, by attempting to swallow such as are too large a morsel. It is immaterial of what species the animal it pursues appears to be, whether of another or its own, all are indiscriminately devoured; so that every fish owes its safety to its minuteness, its celerity, or its courage: nor does the pike confine itself to feed on fish and frogs; it will draw down the water-rat and the young ducks, as they are swimming about. Gesner tells us of a mule that stopped to drink in the water, when a famished pike, that was near, seized it by the nose, nor was it disengaged till the beast flung it on shore. So great is their rapacity, that they will contend with the otter for his prey, and even endeavour to force it from him. For this reason it is dreaded by all other fish; and the small ones show the same uneasiness and detestation at the presence of their tyrant, as the little birds do at the sight of a hawk or an owl. When the pike lies asleep near the surface, as is frequently the case, the lesser fish are observed to swim around it in vast numbers, with a mixture of caution and terror.

The other tribes of fresh-water fish are much inferior to this animal in courage and rapacity: they chiefly subsist upon worms and insects, pursuing them at the bottom, or jumping after them to the surface of the water. In winter also, their appetites seem entirely to forsake them; at least they continue in so torpid a state, that few baits will tempt them to their destruction. At that season, they forsake the shallow water, and seek those deep holes to be found in every river, where they continue for days together, without ever appearing to move. The cold seems to affect them; for at that time they lie close to the bottom, where the water is most warm, and seldom venture out, except the day be peculiarly fine, and the shallows at the edges of the stream become tepified by the powerful rays of the sun. Indeed, I have been assured, that some fishes may be rendered so torpid by the cold, in the northern rivers, as to be frozen up, in the great masses of ice, in which they continue for several months together, seemingly without life or sensation, the prisoners of congelation, and waiting the approach of a warmer sun, to restore them at once to life and liberty. Thus that cheerful luminary not only distributes health and vegetation to the productions of the earth, but is ardently sought even by the gelid inhabitants of the water.

As fish are enemies one to another, so each species is infested with worms of different kinds, peculiar to itself. The great fish abound with them; and the little ones are not entirely free. These troublesome vermin lodge themselves either in the jaws, and the intestines internally, or near the fins without. When fish are healthy and fat they are not much annoyed by them; but in winter, when they are lean or sickly, they then suffer very much.

Nor does the reputed longevity of this class secure them from their peculiar disorders. They are not only affected by too much cold, but there are frequently certain dispositions of the element in which they reside unfavourable to their health and propagation. Some ponds they will not breed in, however artfully disposed for supplying them with fresh recruits of water, as well as provision. In some seasons they are found to feel epidemic disorders and are seen dead by the

Sea Devil, p. 278.

Polypus, vol. i., p. 169.

Cuttlefish, vol. iv., p. 214.

To face p. 308, vol. iii.

water-side, without any apparent cause: yet still they are animals of all others the most vivacious, and they often live and subsist upon such substances as are poisonous to the more perfect classes of Animated Nature.

It is not easy to determine whether the poisonous qualities which many of them are found to possess, either when they wound our bodies externally with their spines, or when they are unwarily eaten at our tables, arise from this cause. That numbers of fishes inflict poisonous wounds, in the opinion of many, cannot be doubted: The concurrent testimony of mankind, they think sufficient to contradict any reasonings upon this head, taken from anatomical inspection. The great pain that is felt from the sting given by the back fin of the weaver, bears no proportion to the smallness of the instrument that inflicts the wound. How the poison is preserved, or how it is conveyed by the animal, it is not in our power to perceive; but its actual existence has been often attested by painful experience. In this instance we must decline conjecture, satisfied with history.

The fact of their being poisonous when eaten, is equally notorious; and the cause equally inscrutable. My poor worthy friend, Dr. Grainger, who resided for many years at St. Christopher's, assured me, that of the fish caught, of the same kind, at one end of the island, some were the best and most wholesome in the world; while others taken at a different end, were always dangerous, and most commonly fatal. We have a paper in the Philosophical Transactions, giving an account of the poisonous qualities of those found at New-Providence, one of the Bahama islands. The author assures us, that the greatest part of the fish of that dreary coast, are all of a deadly nature; their smallest effects being to bring on a terrible pain in the joints, which, if terminating favourably, leaves the patient withou any appetite for several days after. It is not those of the most deformed figure, or the most frightful to look at, that are alone to be dreaded; all kinds, at different times, are alike dangerous; and the same species which has this day served for nourishment, is the next if tried, found to be fatal!

This noxious quality has given rise to much speculation, and many conjectures. Some have supposed it to arise from the fishes on these shores eating of the machineel apple, a deadly vegetable poison, that sometimes grows pendant over the sea; but the quantity of those trees growing in this manner, bears no proportion to the extensive infection of the fish. Labat has ascribed it to their eating the gally fish, which is itself most potently poisonous; but this only removes our wonder a little farther back; for it may be asked, with as just a cause for curiosity, how comes the gally fish itself to procure its noxious qualities? Others have ascribed the poison of these fishes to their feeding upon copperas beds: but I do not know of any copperas mines found in America. In short, as we cannot describe the alembic by which the rattlesnake distils its malignity, nor the process by which the scorpion, that lives among roses, converts their sweets to venom, so we cannot discover the manner by which fishes become thus dangerous; and it is well for us of Europe that we can thus wonder in security. It is certain that, with us, if fishes, such as carp or tench, acquire any disagreeable flavour from the lakes in which they have been bred, this can be removed, by their being kept some time in finer and better water: there they soon clear away all those disagreeable qualities their flesh had contracted, and become as delicate as if they had been always fed in the most cleanly manner. But this expedient is with us rather the precaution of luxury, than the effect of fear; we have nothing to dread from the noxious qualities of our fish; for all the animals our waters furnish are wholesome.

Happy England! where the sea furnishes an abundant and luxurious repast, and the fresh waters an innocent and harmless pastime; where the angler, in cheerful solitude, strolls by the edge of the stream, and fears neither the coiled snake, nor the lurking crocodile; where he can retire at night, with his few trouts, to borrow the pretty description of old Walton, to some friendly cottage, where the landlady is good, and the daughter innocent and beautiful; where the room is cleanly, with lavender in the sheets, and twenty ballads stuck about the wall! There he can enjoy the company of a talkative brother sportsman, have his trouts dressed for supper, tell tales, sing old tunes, or make a catch! There he can talk of the wonders of Nature with learned admiration, or find some harmless sport to content him, and pass away a little time, without offence to God, or injury to man!

END OF THE THIRD VOLUME.

A

HISTORY

OF

THE EARTH

AND

ANIMATED NATURE

BY

OLIVER GOLDSMITH, M.B.

A NEW EDITION,
WITH CORRECTIONS AND ALTERATIONS.

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CONTENTS.

VOL. IV.

PART IV.

FISHES CONTINUED.

BOOK IV.

CRUSTACEOUS AND TESTACEOUS FISHES.

Page.
CHAP I. The Division of Shell-Fish 5
CHAP II. Crustaceous Animals of the Lobster Kind 6
CHAP III. The Tortoise and its Kinds 14
CHAP IV. The Shell of Testaceous Fishes 23
CHAP V. Turbinated Shell-fish of the Snail Kind 29
CHAP. VI. Bivalved Shell-fish, or Shells of the Oyster Kind 37
CHAP. VII. Multivalve Shell-fish 44

PART V

FROGS, LIZARDS, AND SERPENTS.

BOOK I.

FROGS AND TOADS.

CHAP. I Frogs and toads in general 48
CHAP. II. The Frog and its Varieties 49
CHAP. III. The toad and its Varieties 54

BOOK II.

THE LIZARD KIND.

CHAP. I. Lizards in general 59
CHAP. II. The Crocodile and its affinities 64
CHAP. III. The Salamander 71
CHAP. IV. The Chamelion, the Iguana, and Lizards of different Kinds 74

BOOK III.

SERPENTS, &C.

CHAP. I. Serpents in general 79
CHAP. II. Venomous Serpents in general 91
CHAP. III. Serpents without venom 100

PART VI.

INSECTS.

BOOK I.

INSECTS OF THE FIRST ORDER.

CHAP. I. Insects in general 105
CHAP. II. Insects without Wings 109

Page.
CHAP. III. The spider and its Varieties 110
CHAP. IV. The Flea 117
CHAP. V. The Louse and its Varieties 118
CHAP. VI. The Bug and its Varieties 122
CHAP. VII. The Woodlouse and its Varieties 123
CHAP. VIII. The Monoculus, or Arborescent Water-flea 124
CHAP. IX. The Scorpion and its Varieties 125
CHAP. X. The Scolopendra and Galley-worm 129
CHAP. XI. The Leech 136

BOOK II.

INSECTS OF THE SECOND ORDER.

CHAP. I. The Second Order of Insects in general 133
CHAP. II. The Libella, or Dragon-fly . . . . ib.
CHAP. III. The Formica Leo, or Lion-Ant 136
CHAP. IV. The Grasshopper, the Locust, the Cicada, the Cricket, and the Mole-Cricket 139
CHAP. V. The Earwig, the Froth Insect, and others belonging to the Second Order of Insects 147
CHAP. VI. The Ephemera 149

BOOK III.

INSECTS OF THE THIRD ORDER.

CHAP. I. Caterpillars in general - - - - - - - - - - - - - - - - - 153
CHAP. II. The Transformation of the Caterpillar into its corresponding Butterfly or Moth - - - - - - - - - - - - - - - - - - 154
CHAP. III. Butterflies and Moths - - - - - - - - - - - - - - - - - 163
CHAP. IV. The Enemies of the Caterpillar - - - - - - - - - - - 167
CHAP. V. The Silkworm - 169

BOOK IV.

INSECTS OF THE FOURTH ORDER

CHAP. I. The Fourth Order of Insects in general - - - - - - - 174
CHAP. II. The Bee - ib.
CHAP. III. The Wasp - 186
CHAP. IV. The Ichneumon Fly - 191
CHAP. V. The Ant - 192
CHAP. VI. The Beetle and its Varieties - - - - - - - - - - - - - 197
CHAP. VII. The Gnat and Tipula - - - - - - - - - - - - - - - - - 205

BOOK V.

THE ZOOPHYTES.

CHAP. I. Zoophytes in general - - - - - - - - - - - - - - - - - 209
CHAP. II. Worms - - - - 211
CHAP. III. The Star-fish 214
CHAP. IV. The Polypus 215
CHAP. V. Lythophytes and Sponges 220

A

HISTORY OF ANIMALS.

PART IV.

OF FISHES, CONTINUED.

BOOK IV.

OF CRUSTACEOUS AND TESTACEOUS FISHES

CHAPTER I.

THE DIVISION OF SHELL FISH.

In describing the inhabitants of the water, a class of animals occur, that mankind, from the place of their residence, have been content to call fish; but that naturalists, from their formation, have justly agreed to be unworthy of the name. Indeed, the affinity many of this kind bear to the insect tribe, may very well plead for the historian who ranks them rather as insects. However, the common language of a country must not be slightly invaded; the names of things may remain, if the philosopher be careful to give precision to our ideas of them.

There are two classes of animals, therefore, inhabiting the water, which commonly receive the name of fishes, entirely different from those we have been describing, and also very distinct from each other. These are divided by naturalists into Crustaceous and Testaceous Animals: both, totally unlike fishes to appearance, seem to invert the order of Nature; and as those have their bones on the inside, and their muscles hung upon them for the purposes of life and motion, these, on the contrary, have all their bony parts on the outside, and all their muscles within. Not to talk mysteriously—all who have seen a lobster or an oyster, perceive that the shell in these bears a strong analogy to the bones of other animals; and that, by these shells, the animal is sustained and defended.

Crustaceous fish, such as the crab and the lobster, have a shell not quite of a stony hardness, but rather resembling a firm crust, and in some measure capable of yielding.—Testaceous fishes, such as the oyster or cockle, are furnished with a shell of a stony hardness; very brittle, and incapable of yielding. Of the crustaceous kinds are the Lobster, the Crab, and the Tortoise: of the testaceous, that numerous tribe of Oysters, Muscles, Cockles, and Sea-Snails, which offer with infinite variety.

The crustaceous tribe seems to hold the middle rank between fishes, properly so called, and those snail-like animals that receive the name of testaceous fishes. Their muscles are strong and firm, as in the former; their shell is self-produced, as among the latter. They have motion, and hunt for food with great avidity, like the former.—They are incapable of swimming, but creep along the bottom, like the latter: in short, they form the link that unites these two classes, that seem so very opposite in their natures.

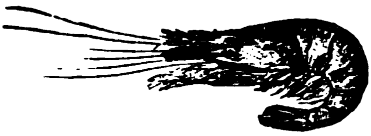
Of testaceous fishes we will speak hereafter. As to animals of the crustaceous kind, they are very numerous, their figure offers an hundred varieties: but as to their nature, they are obviously divided into two very distinct kinds, differing in their habits and their conformation.—The chief of one kind is the Lobster; the chief of the other, the Tortoise. Under the Lobster we rank the Prawn, the Craw-Fish, the Shrimp, the Sea-Crab, the Land-Crab, and all their varieties. Under the Sea-Tortoise, the Turtle, the Hawksbill-Turtle, the Land-Tortoise, and their numerous varieties.

CHAPTER II.

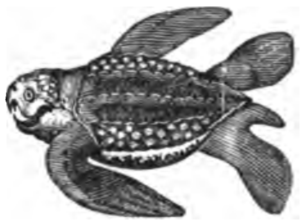
CRUSTACEOUS ANIMALS OF THE LOBSTER KIND.

HOWEVER different in figure the lobster and the crab may seem, their manners and conformation are nearly the same. With all the voracious appetites of fishes, they are condemned to lead an insect life at the bottom of the water; and, though pressed by continual hunger, they are often obliged to wait till accident brings them their prey. Though without any warmth in their bodies, or even without red blood circulating through their veins, they are animals wonderfully voracious. Whatever they seize upon that has life, is sure to perish, though never so well defended; they even devour each other: and, to increase our surprise still more, they may, in some measure, be said to eat themselves; as they change their shell and their stomach every year, and their old stomach is generally the first morsel that serves to glut the new.

The lobster is an animal of so extraordinary a form, that those who first see it are apt to mistake the head for the tail; but it is soon discovered that the animal moves with its claws foremost; and that the part which plays within itself by joints, like a coat of armour, is the tail. The two great claws are the lobster's instruments of provision and defence; these, by opening like a pair of nippers, have great strength and take a firm hold; they are usually notched like a saw, which still more increases their tenacity. Besides these powerful instruments, which may be considered as arms, the lobster has eight legs, four on each side, and these, with the tail, serve to give the animal its progressive and sideling motion. Between the two claws is the animal's head, very small, and furnished with eyes that seem like two black horny specks on each side; and these it has a power of advancing out of the socket, and drawing in at pleasure. The mouth, like that of insects, opens the long way of the body, not crossways, as with man, and the higher race of animals. It is furnished with two teeth for the comminution of its food; but, as these are not sufficient, it has three more in the stomach;



Shrimp, p. 6



Variety of the Sea Tortoise, p. 20.

Sea Tortoise, p. 20.

Crab p. 9.

Lobster, p. 6.

To face p. 6, vol. iv.

one on each side, and the other below. Between the two teeth there is a fleshy substance, in the shape of a tongue. The intestines consist of one long bowel, which reaches from the mouth to the vent; but what this animal differs in from all others, is, that the spinal-marrow is in the breast-bone It is furnished with two long feelers or horns, that issue on each side of the head, that seem to correct the dimness of its sight, and apprize the animal of its danger or of its prey. The tail, or that jointed instrument at the other end, is the grand instrument of motion: and with this it can raise itself in the water. Under this we usually see lodged the spawn in great abundance; every pea adhering to the next by a very fine filament, which is scarcely perceivable. Every lobster is a hermaphrodite, and is supposed to be self-impregnated! The ovary, or place where the spawn is first produced, is backwards towards the tail, where a red substance is always found, and which is nothing but a cluster of peas, that are yet too small for exclusion From this receptacle there go two canals, that open on each side at the jointures of the shell, at the belly; and through these passages the peas descend to be excluded, and placed under the tail, where the animal preserves them from danger for some time, until they come to maturity; when being furnished with limbs and motion, they drop off into the water.

When the young lobsters leave the parent, they immediately seek for refuge in the smallest clefts of rocks, and in such like crevices at the bottom of the sea, where the entrance is but small, and the opening can be easily defended. There, without seeming to take any food, they grow larger in a few weeks time, from the mere accidental substances which the water washes to their retreats. By this time, also, they acquire a hard firm shell, which furnishes them with both offensive and defensive armour. They then begin to issue from their fortresses, and boldly creep along the bottom, in hopes of meeting with more diminutive plunder. The spawn of fish, the smaller animals of their own kind, but chiefly the worms that keep at the bottom of the sea, supply them with plenty. They keep in this manner close among the rocks, busily employed in scratching up the sand with their claws for worms, or surprising such heedless animals as fall within their grasp: thus they have little to apprehend, except from each other; for in them, as among fishes, the large are the most formidable of all other enimies to the small.

But this life of abundance and security is soon to have a most dangerous interruption; for the body of the lobster still continuing to increase, while its shell remains unalterably the same, the animal becomes too large for its habitation, and imprisoned within the crust that has naturally gathered round it, there comes on a necessity of getting free. The young of this kind, therefore, that grow faster, as I am assured by the fisherman, change their shell oftener than the old, who come to their full growth, and who remain in the same shell often for two years together. In general, however, all these animals change their shell once a year; and this is not only a most painful operation, but also subjects them to every danger. Their moulting season is generally about the beginning of summer, at which time their food is in plenty, and their strength and vigour in the highest perfection. But soon all their activity ceases; they are seen forsaking the open parts of the deep, and seeking some retired situation among the rocks, or some outlet where they may remain in safety from the attacks of their various enemies. For some days before their change, the animal discontinues its usual voraciousness; it is no longer seen laboriously harrowing up the sand at the bottom, or fighting with others of its kind, or hunting its prey; it lies torpid and motionless, as if in anxious expectation of the approaching change. Just before casting its shell, it throws itself upon its back, strikes its claws against each other, and every limb seems to tremble; its feelers are agitated, and the whole body is in violent motion; it then swells itself in an unusual manner, and at last the shell is seen beginning to divide at its junctures; particularly, it opens at the junctures of the belly, where, like a pair of jumps, it was before but seemingly united. It also seems turned inside out, and its stomach comes away with its shell.—After this, by the same operation, it disengages itself of the claws, which burst at the joints; the animal,with a tremulous motion, casting them off as a man would kick off a boot that was too big for him.

Thus, in a short time, this wonderful creature finds itself at liberty; but in so weak and enfeebled a state, that it continues for several hours motionless. Indeed, so violent and painful is the operation, that many of them die under it; and those who survive are in such a weakly state for some time, that they neither take food nor venture from their retreats. Immediately after this change, they have not only the softness but the timidity of a worm. Every animal of the deep is then a powerful enemy, which they can neither escape nor oppose; and this, in fact, is the time when the dog-fish, the cod, and the ray, devour them by hundreds. But this state of defenceless imbecility continues for a very short time: the animal, in less than two days, is seen to have the skin that covered its body grown almost as hard as before; its appetite is seen to increase; and, strange to behold! the first object that tempts its gluttony, is its own stomach, which it so lately was disengaged from. This it devours with great eagerness; and sometime after eats even its former shell. In about forty-eight hours, in proportion to the animal's health and strength, the new shell is perfectly formed, and as hard as that which was but just thrown aside.

To contribute to the speedy growth of the shell it is supposed by some, that the lobster is supplied with a very extraordinary concretion within its body, that is converted into the shelly substance. It is a chalky substance, found in the lower part of the stomach of all lobsters improperly called crab's eyes, and sold under that title in the shops. About the time the lobster quits its shell, the teeth in its stomach break these stones to pieces, and the fluids contained therein dissolve them. This fluid, which still remains in the new stomach, is thought to be replete with a petrifying quality, proper for forming a new shell: however, the concreting power that first formed these, shows a sufficient power in the animal to produce also the shell; and it is going but a short way in the causes of things when we attempt to explain one wonder by another.

When the lobster is completely equipped in its new shell, it then appears how much it has grown in the space of a very few days; the dimensions of the old shell being compared with those of the new, it will be found that the creature is increased above a third in its size; and, like a boy that has outgrown his clothes, it seems wonderful how the deserted shell was able to contain so great an animal as entirely fills up the new.

The creature thus furnished, not only with a complete covering, but also a greater share of strength and courage, ventures more boldly among the animals at the bottom; and not a week passes, that, in its combats, it does not suffer some mutilation. A joint, or even a whole claw, is sometimes snapped off in these encounters. At certain seasons of the year these animals never meet each other without an engagement. In these, to come off with the loss of a leg, or even a claw, is considered as no great calamity; the victor carries off the spoil to feast upon at leisure, while the other retires from the defeat to wait for a thorough repair. This repair it is not long in procuring. From the place where the joint of the claw was cut away, is seen in a most surprising manner to bourgeon out the beginning of a new claw. This, if observed, at first, is small and tender, but grows, in the space of three weeks, to be almost as large and as powerful as the old one. I say almost as large, for it never arrives to the full size; and this is the reason we generally find the claws of lobsters of unequal magnitude.

After what has been thus described, let us pause a little, to reflect on the wonders this extraordinary creature offers to our imagination! An animal without bones on the inside, yet furnished with a stomach capable of digesting the hardest substances, the shells of muscles, of oysters, and even its own; an animal gaining a new stomach and a new shell at stated intervals! Furnished with the instruments of generation double in both sexes; and yet with an apparent incapacity of uniting! Without red blood circulating through the body, and yet apparently vigorous and active! But, most strange of all, an animal endowed with a vital principle that furnishes out such limbs as have been cut away, that keeps continually combating though in constant repair to renew its engagements! These are but a small part of the wonders of the deep, where Nature sports without a spectator!

Of this extraordinary yet well known animal there are many varieties, with some difference in the claws, but little in the habits or conformation. It is found above three feet long; and if we may admit the shrimp and the prawn into the class, though unfurnished with claws, it is seen not above an inch. These all live in the water, and can bear its absence for but a few hours. The shell is black when taken out of the water, but turns red by boiling. The most common way of taking the lobster is in a basket, or pot, as the fishermen call it, made of wicker-work, in which they put the bait, and then throw it to the bottom of the sea, in six or ten fathoms water. The lobsters creep into this for the sake of the bait, but are not able to get out again. The river craw-fish differs little from the lobster, but that the one will live only in fresh water, and the other will thrive only in the sea.

The crab is an animal found equally in fresh and salt water; as well upon land as in the ocean. In shape it differs very much from the lobster, but entirely resembles it in habits and conformation. The tail in this animal is not so apparent as in the former, being that broad flap that seems to cover a part of the belly, and when lifted discovers the peas or spawn, situated there in great abundance. It resembles the lobster in the number of its claws, which are two, and its legs, which are eight, four on either side. Like the lobster, it is a bold voracious animal; and such an enmity do crabs bear each other, that those who carry them for sale to market, often tie their claws with strings to prevent their fighting and maiming themselves by the way. In short, it resembles the lobster in every thing but the amazing bulk of its body compared to the size of its head, and the length of its intestines, which have many convolutions.

As the crab, however, is found upon land as well as in water, the peculiarity of its situation produces a difference in its habitudes, which it is proper to describe. The Land Crab is found in some of the warmer regions of Europe, and in great abundance in all the tropical climates in Africa and America. They are of various kinds, and endued with various properties; some being healthful, delicious, and nourishing food; others, poisonous or malignant to the last degree; some are not above an half inch broad, others are found a foot over; some are of a dirty brown, and others beautifully mottled. That animal called the Violet Crab of the Carribbee Island, is the most noted both for the shape, the delicacy of its flesh, and the singularity of its manners.

The violet crab somewhat resembles two hands cut through the middle and joined together; for each side looks like four fingers, and the two nippers or claws resemble the thumbs. All the rest of the body is covered with a shell as large as a man's hand and bunched in the middle, on the fore-part of which there are two long eyes of the size of a grain of barley, as transparent as crystal, and as hard as horn. A little below these is the mouth, covered with a sort of barbs, under which there are two broad sharp teeth as white as snow. They are not placed, as in other animals, crossways, but in the opposite direction, not unlike the blades of a pair of scissors. With these teeth they can easily cut leaves, fruits, and rotten wood, which is their usual food. But their principal instruments for cutting and seizing their food is their nippers, which catch such a hold, that the animal loses the limb sooner than its grasp, and is often seen scampering off, having left its claws still holding fast upon the enemy.—The faithful claw seems to perform its duty, and keeps for above a minute fastened upon the finger while the crab is making off.* In fact, it loses no great matter by leaving a leg or an arm, for they soon grow again, and the animal is found as perfect as before.

This, however, is the least surprising part of this creature's history; and what I am going to relate, were it not as well known and as confidently confirmed as any other circumstance in natural history, it might well stagger our belief. These animals live not only in a kind of orderly society in their retreats in the mountains, but regularly once a year march down to the sea-side in a body of some millions at a time. As they multiply in great numbers, they choose the months of April or May to begin their expedition; and then they sally out by thousands from the stumps of hollow trees, from the clefts of the rocks, and from the holes which they dig for themselves under the surface of the earth. At that time the whole ground is covered with this band of adventurers; there is no setting down one's foot without treading upon them†. The sea is their place of destination, and to that they direct their march with right-lined precision. No geometrician could send them to their destined station by a shorter course; they neither turn to the right nor left, whatever obstacles intervene; and even if they meet with a house, they will attempt to scale the walls to keep the unbroken tenor of their way. But though this be the general order of their route, they upon other occasions are compelled to conform to the face of the country; and if it be intersected by rivers, they are then seen to wind along the course of the stream. The procession sets forward from the mountains with the regularity of an army, under the guidance of an experienced commander. They are commonly divided into three battalions; of which, the first consists of the strongest and boldest males, that, like pioneers, march forward to clear the route and face the greatest dangers. These are often obliged to halt for want of rain, and go into the most convenient encampment till the weather changes. The main body of the army is composed of females, which never leave the mountains till the rain is set in for some time, and then descend in regular battalia, being formed into columns of fifty paces broad and three miles deep, and so close that they almost cover the ground. Three or four days after this the rear-guard follows; a straggling, undisciplined tribe, consisting of males and females, but neither so robust nor so numerons as the former. The night is their chief time of proceeding; but if it rains by day, they do not fail to profit by the occasion; and they continue to move forward in their slow uniform manner. When the sun shines and is hot upon the surface of the ground, they then make an universal halt, and wait till the cool of the evening. When they are terrified, they march back in a confused disorderly manner, holding up their nippers, with which they sometimes tear off a piece of the skin, and then leave the weapon where they inflicted the wound. They even try to intimidate their enemies; for they often clatter their nippers together, as if it were to threaten those that come to disturb them. But though they thus strive to be formidable to man, they are much more so to each other; for they are possessed of one most unsocial property, which is, that if any of them by accident is maimed in such a manner as to be incapable of proceeding, the rest fall upon and devour it on the spot, and then pursue their journey.

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* Brown's Jamaica, p. 423.

† Labat. Voyage aux Isles Francoises, vol. ii. p. 221.

When after a fatiguing march and escaping a thousand dangers (for they are sometimes three months in getting to the shore) they have arrived at their destined port, they prepare to cast their spawn. The peas are as yet within their bodies, and not excluded, as is usual in animals of this kind, under the tail; for the creature waits for the benefit of the sea-water to help the delivery. For this purpose, the crab has no sooner reached the shore, than it eagerly goes to the edge of the water, and lets the waves wash over its body two or three times. This seems only a preparation for bringing the spawn to maturity; for without farther delay they withdraw to seek a lodging upon land: in the mean time, the spawn grows larger, is excluded out of the body, and sticks to the barbs under the flap, or more properly the tail. This bunch is seen as big as a hen's egg, and exactly resembling the roes of herrings. In this state of pregnancy, they once more seek the shore for the last time, and shaking off their spawn into the water, leave accident to bring it to maturity. At this time whole shoals of hungry fish are at the shore in expectation of this annual supply; the sea to a great distance seems black with them; and about two-thirds of the crab's eggs are immediately devoured by these rapacious invaders. The eggs that escape are hatched under the sand; and soon after millions at a time of these little crabs are seen quitting the shore, and slowly travelling up to the mountains.

The old ones, however, are not so active to return; they have become so feeble and lean, that they can hardly creep along, and the flesh at that time changes its colour. The most of them, therefore, are obliged to continue in the flat parts of the country till they recover, making holes in the earth, which they cover at the mouth with leaves and dirt, so that no air may enter. There they throw off their old shells, which they leave as it were quite whole, the place where they opened on the belly being unseen. At that time they are quite naked, and almost without motion for six days together, when they become so fat as to be delicious food. They have then under their stomachs four large white stones, which gradually decrease in proportion as the shell hardens, and when they come to perfection are not to be found. It is at that time that the animal is seen slowly making its way back; and all this is most commonly performed in the space of six weeks.

This animal when possessed of its retreats in the mountains is impregnable; for only subsisting upon vegetables, it seldom ventures out; and its habitation being in the most inaccessible places, it remains for a great part of the season in perfect security. It is only when impelled by the desire of bringing forth its young, and when compelled to descend into the flat country, that it is taken. At that time the natives wait for its descent in eager expectation, and destroy thousands; but disregarding the bodies, they only seek for that small spawn which lies on each side of the stomach within the shell; of about the thickness of a man's thumb. They are much more valuable upon their return after they have cast their shell; for being covered with a skin resembling soft parchment, almost every part except the stomach may be eaten. They are taken in their holes by feeling for them in the ground with an instrument: they are sought after by night, when on their journey, with flambeaux. The instant the animal perceives itself attacked, it throws itself on its back, and with its claws pinches most terribly whatever it happens to fasten on. But the dexterous crab-catcher takes them by the hinder legs in such a manner, that its nippers cannot touch him, and thus he throws it into his bag. Sometimes also they are caught when they take refuge at the bottom of holes, in the rocks by the sea-side, by clapping a stick at the mouth of the hole, which prevents their getting out; and then soon after the tide coming, enters the hole, and the animal is found, upon its retiring, drowned in its retreat.

These crabs are of considerable advantage to the natives; and the slaves very often feed entirely upon them. In Jamaica, where they are found in great plenty, they are considered as one of the greatest delicacies of the place.—Yet still, the eating of them is attended with some danger; for even of this kind many are found poisonous, being fed, as it is thought, upon the machineel apple; and whenever they are found under that noxious plant, they are always rejected with caution. It is thus with almost all the productions of those luxurious climates; however tempting they may be to the appetite, they but too often are found destructive; and scarce a delicacy among them that does not carry its own alloy.

The descent of these creatures for such important purposes, deserves our admiration; but there is an animal of the lobster kind that annually descends from its mountains in like manner, and for purposes still more important and various. Its descent is not only to produce an offspring, but to provide itself a covering; not only to secure a family, but to furnish a house. The animal I mean is the soldier-crab, which has some similitude to the lobster, if divested of its shell. It is usually about four in ches long, has no shell behind, but is covered down to the tail with a rough skin terminating in a point. It is, however, armed with strong hard nippers before, like the lobster; and one of them is as thick as a man's thumb, and pinches most powerfully. It is, as I said, without a shell to any part except its nippers; but what nature has denied this animal, it takes care to supply by art; and taking possession of the deserted shell of some other animal, it resides in it, till, by growing too large for its habitation, it is under a necessity of change. It is a native of the West India Islands; and, like the former it is seen every year descending from the mountains to the seashore, to deposit its spawn, and to provide itself with a new shell. This is a most bustling time with it, having so many things to do; and, in fact, very busy it appears. It is very probable that its first care is to provide for its offspring before it attends to its own wants; and it is thought, from the number of little shells which it is seen examining, that it deposits its spawn in them, which thus is placed in perfect security till the time of exclusion.

However this be, the soldier is in the end by no means unmindful of itself. It is still seen in its old shell, which it appears to have considerably outgrown; for a part of the naked body is seen at the mouth of it, which the habitation is too small to hide. A shell, therefore, is to be found large enough to cover the whole body; and yet not so large as to be unmanageable and unwieldy. To answer both these ends it is no easy matter, nor the attainment of a slight inquiry. The little soldier is seen busily parading the shore along that line of pebbles and shells that is formed by the extremest wave; still, however, dragging its old incommodious habitation at its tail, unwilling to part with one shell even though a troublesome appendage, till it can find another more convenient. It is seen stopping at one shell, turning it and passing it by, going on to another, contemplating that for a while, and then slipping its tail from its old habitation, to try on the new. This also is found to be inconvenient; and it quickly returns to its old shell again. In this manner it frequently changes, till at last it finds one light, roomy, and commodious; to this it adheres, though the shell be sometimes so large as to hide the body of the animal, claws and all.*

Yet it is not till after many trials, but many combats also, that the soldier is thus completely equipped; for there is often a contest between two of them for some well-looking favourite shell for which they are rivals. They both endeavour to take possession; they strike with their claws, they bite each other, till the weakest is obliged to yield, by giving up the object of dispute. It is then that the victor immediately takes possession, and parades it in his new conquest three or four times backward and forward upon the strand before his envious antagonist.

When this animal is taken, it sends forth a feeble cry, endeavouring to seize the enemy with its nippers; which if it fastens upon it will sooner die than quit the grasp. The wound is very painful, and not easily cured. For this reason, and as it is not much esteemed for its flesh, it is generally permitted to return to its old retreat in the mountains in safety. There it continues till the necessity of changing once more, and the desire of producing an offspring, expose it to fresh dangers the year ensuing.

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* Peru du Testre.

CHAPTER III.

OF THE TORTOISE AND ITS KINDS.

HAVING described the lobster and the crab as animals in some measure approaching to the insect tribes, it will appear like injustice to place the Tortoise among the number, that, from its strength, its docility, the warm red blood that is circulating in its veins, deserves to be ranked even above the fishes. But as this animal is covered, like the lobster, with a shell; as it is of an amphibious nature, and brings forth its young from the egg without hatching, we must be content to degrade it among animals that in every respect it infinitely surpasses.

Tortoises are usually divided into those that live upon land, and those that subsist in the water; and use has made a distinction even in the name; the one being called Tortoises, the other Turtles. However, Seba has proved that all tortoises are amphibious; that the land tortoise will live in the water, and that the sea turtle can be fed upon land. A land tortoise was brought to him that was caught in one of the canals of Amsterdam, which he kept for half a year in his house, where it lived very well contented in both elements. When in the water it remained with its head above the surface; when placed in the sun, it seemed delighted with its beams, and continued immoveable while it felt their warmth. The difference, therefore, in these animals, arises rather from their habits than their conformation; and, upon examination, there will be less variety found between them than between birds that live upon land, and those that swim upon the water.

Yet, though Nature seems to have made but few distinctions among these animals as to their conformation, yet, in their habits, they are very dissimilar; as these result from the different qualities of their food, and the different sorts of enemies they have to avoid or encounter. I will therefore exhibit their figure and conformation under one common description, by which their slight differences will be more obvious; and then I will give a separate history of the manners of each, as naturalists and travellers have taught us.

All tortoises in their external form, pretty much resemble each other; their outward covering being composed of two great shells, the one laid upon the other, and only touching at the edges: however, when we come to look closer, we shall find that the upper shell is composed of no less than thirteen pieces, which are laid flat upon the ribs, like the tiles of a house, by which the shell is kept arched and supported. The shells both above and below, that, which seem, to an inattentive observer, to make each but one piece, are bound together at the edges by very strong and hard ligaments, yet with some small share of motion. There are two holes at either edge of this vaulted body; one for a very small head, shoulders, and arms to peep through; the other at the opposite edge, for the feet and the tail. These shells the animal is never disengaged from; and they serve for its defence against every creature but man.

The tortoise has but a small head, with no teeth; having only two bony ridges in the place, serrated and hard. These serve to gather and grind its food; and such is the amazing strength of the jaws, that it is impossible to open them where they have once fastened. Even when the head is cut off, the jaws still keep their hold; and the muscles, in death, preserve a tenacious rigidity. Indeed, the animal is possessed of equal strength in all other parts of its body: the legs, though short, are inconceivably strong: and torpid as the tortoise may appear, it has been known to carry five men standing upon his back, with apparent ease and unconcern. Its manner of going forward is by moving its legs one after the other; And the claws with which the toes are furnished, sink into the ground like the nails of an iron-shod wheel, and assist its progression.

With respect to its internal parts, not to enter into minute anatomical disquisitions, it may not be improper to observe, that the blood circulates in this animal as in some cartilaginous fishes, and something in the manner of a child in the womb. The greatest quantity of the blood passes directly from the vena cava into the left ventricle of the heart, which communicates with the right ventricle by an opening; while the auricles only receive what the ventricles seem incapable of admitting. Thus the blood is driven by a very short passage through the circulation; and the lungs seem to lend only occasional assistance. From this conformation the animal can subsist for some time, without using the lungs or breathing; at least, the lungs are not so necessary an instrument for driving on the circulation as with us.

Such is the general structure of this animal, whether found to live by land or water. With regard to the differences of these animals, the land-tortoise, from its habits of making use of its feet in walking, is much more nimble upon land than the sea-turtle: the land-tortoise, if thrown upon its back, by rocking and balancing its body, like a child rocking in a cradle, at last turns itself upon its face again; but the turtle, when once turned, continues without being able to move from the spot. In comparing the feet also of these animals, the nails upon the toes of one that has been used to scratch for subsistence upon land, are blunt and worn; while those that have only been employed in swimming, are sharp and long, and have more the similitude of fins. The brain of the land-tortoise is but small; and yet it is three times as large as that of the turtle.—There is a difference also in the shape of their eggs, and in the passage by which they are excluded; for, in the land-tortoise, the passage is so narrow, that the egg conforms to the shape of the aperture, and though round when in the body, yet becomes much more oblong than those of fowls, upon being excluded; otherwise they would never be able to pass through the bony canal by which they are protruded; on the contrary, the passage is wider in the turtle, and therefore its eggs are round. These are the most striking distinctions; but that which is most known is their size; the land-tortoise often not exceeding three feet long, by two feet broad; the sea-turtle being sometimes from five to seven feet long. The size, however, is but a fallacious distinction; since land-tortoises, in some parts of India, grow to a very great magnitude; though probably not as the ancients affirm, big enough for a single shell to serve for the covering of a house.

But if the different kinds of tortoises are not sufficiently distinguished by their figure, they are very obviously distinguishable by their methods of living. The land-tortoise lives in holes dug in the mountains, or near marshy lakes; the sea-turtle in cavities of rocks, and extensive pastures at the bottom of the sea. The tortoise makes use of its feet to walk with, and burrow in the ground; the turtle chiefly uses its feet in swimming, or creeping at the bottom.

The land-tortoise is generally found, as was observed above, from one foot to five feet long, from the end of the snout to the end of the tail; and from five inches to a foot and a half across the back. It has a small head, somewhat resembling that of a serpent; an eye without the upper lid; the under eye-lid serving to cover and keep that organ in safety, It has a strong scaly tail, like the lizard. Its head the animal can put out and hide at pleasure, under the great penthouse of its shell: there it can remain secure from all attacks; there, defended on every side, it can fatigue the patience of the most formidable animal of the forest, that makes use only of natural strength to destroy it. As the tortoise lives wholly upon vegetable food, it never seeks the encounter; yet, if any of the smaller animals attempt to invade its repose, they are sure to suffer. The tortoise, impregnably defended, is furnished with such a strength of jaw, that, though armed only with bony plates instead of teeth, wherever it fastens, it infallibly keeps its hold, until it has taken out the piece.

Though peaceable in itself, it is formed for war in another respect, for it seems almost endued with immortality. Nothing can kill it; the depriving it of one of its members, is but a slight injury; it will live, though deprived of the brain; it will live though deprived of its head. Rhedi informs us, that in making some experiments upon vital motion, he, in the beginning of the month of November, took a land-tortoise, made a large opening in its scull, and drew out all the brain, washed the cavity, so as not to leave the smallest part remaining, and then, leaving the hole open, set the animal at liberty. Notwithstanding this, the tortoise marched away without seeming to have received the smallest injury; only it shut the eyes, and never opened them afterwards Soon after the hole in the skull was seen to close; and, in three days, there was a complete skin covering the wound. In this manner the animal lived without a brain, for six months; walking about unconcernedly, and moving its limbs as before. But the Italian philosopher, not satisfied with this experiment, carried it still farther; for he cut off the head, and the animal lived twenty-three days after its separation from the body. The head also continued to rattle the jaws, like a pair of castanets, for above a quarter of an hour.

Nor are these animals less long-lived than difficult in destroying. Tortoises are commonly known to exceed eighty years old; and there was one kept in the Archbishop of Canterbury's garden, at Lambeth, that was remembered above a hundred and twenty. It was at last killed by the severity of a frost, from which it had not sufficiently defended itself in its winter retreat, which was a heap of sand, at the bottom of the garden.

The usual food of the land-tortoise seems not so nourishing as to supply this extraordinary principle of vitality. It lives upon vegetables in its retreats in the mountains or the plain; and seldom makes its prey of snails or worms, but when other food is not found in grateful plenty. It is fond also of fruits; and when the forest affords them, is generally found not far from where they grow. As it can move but slowly, it is not very delicate in the choice of its food; so that it usually fills itself with whatever offers. Those that are kept in a domestic state, will eat any thing; leaves fruits, corn, bran, or grass.

From the smallness of its brain, and the slowness of its motion, it obviously appears to be a torpid, heavy animal, requiring rest and sleep; and, in fact, it retires to some cavern to sleep for the winter. I already observed that its blood circulated through the heart by a short passage; and that it did not, as anatomists express it, go through the great circulation. With us, and quadrupeds, the blood goes from the veins to the heart; from the heart it is sent to be spread over the lungs; from the lungs it returns to the heart again; and from thence it goes to the arteries to be distributed through the whole body. But its passage in the tortoise is much shorter; for, from the veins it goes to the heart; then leaving the lungs entirely out of its course, it takes a short cut, if I may so say, into the beginning of the arteries, which send it round the animal frame. From hence we see the lungs are left out of the circulation; and, consequently, the animal is capable of continuing to live without continuing to breathe. In this it resembles the bat, the serpent, the mole, and the lizard; like them it takes up its dark residence for the winter; and, at that time, when its food is no longer in plenty, it happily becomes insensible to the want. Nor is it unmindful to prepare its retreat, and make it as convenient as possible; it is sometimes buried two or three feet in the ground, with its hole furnished with moss, grass, and other substances, as well to keep the retreat warm, as to serve for food, in case it should prematurely wake from its state of stupefaction. But it must not be supposed that, while it is thus at rest, it totally discontinues to breathe; on the contrary, an animal of this kind, if put into a close vessel, without air, will soon be stifled; though not so readily as in a state of vigour and activity.

From this dormant state the tortoise is awakened by the genial return of spring; and is thought not to be much wasted by its long confinement. To animals that live an hundred and fifty years, a sleep of six months is but as the nap of a night. All the actions of these long-lived creatures seem formed upon a scale answering the length of their existence: their slumbers are for a season; their motions are slow, and require time in every action: even the act of procreation, which among other animals is performed in a very few minutes, is with them the business of days.—About a month after their enlargement from a torpid state, they prepare to transmit their posterity; and both continue joined for near a month together. The eggs of the female are contained in the ovary, above the bladder, which is extremely large; and these are, before their exclusion, round and naked, with some spots of red: after they are laid, however, they assume another form, being smaller and longer than those of a hen. This alteration in the figure of the eggs most probably proceeds from the narrowness of the bony passage through which they are excluded. Swammerdam, who compared the size of the eggs taken out of this animal's body with the diameter of the passage through which they were excluded, was of opinion that the bones themselves separated from each other, and closed again; but, in my opinion, it is more probable to suppose, that the eggs, and not the bones, alter their form. Certain it is, that they are round in the body, and that they are oval upon being protruded.

The eggs of all the tortoise kind, like those of birds, are furnished with a yolk and a white; but the shell is different, being somewhat like those soft eggs that hens exclude before their time: however, this shell is much thicker and stronger, and is a longer time in coming to maturity in the womb

The land tortoise lays but a few in number, if compared to the sea-turtle, who deposits from a hundred and fifty to two hundred in a season.

The amount of the land tortoise's eggs I have not been able to learn; but, from the scarceness of the animal, I am apt to think they cannot be very numerous. When it prepares to lay, the female scratches a slight depression in the earth, generally in a warm situation, where the beams of the sun have their full effect: there depositing her eggs, and covering them with grass and leaves, she forsakes them, to be hatched by the heat of the season. The young tortoises are generally excluded in about twenty-six days; but, as the heat of the weather assists, or its coldness retards incubation, sometimes it happens that there is a difference of two or three days. The little animals no sooner leave the egg than they seek for their provision, entirely self-taught; and their shell, with which they are covered from the beginning, expands and grows larger with age: as it is composed of a variety of pieces, they are all capable of extension at their sutures, and the shell admits of increase in every direction. It is otherwise with those animals, like the lobster, whose shell is composed all of one piece, that admits of no increase; which, when the tenant is too big for the habitation, must burst the shell, and get another. But the covering of the tortoise grows larger in proportion as the internal parts expand; in some measure resembling the growth of the human skull, which is composed of a number of bones, increasing in size in proportion to the quantity of the brain. All tortoises, therefore, as they never change their shell, must have it formed in pieces; and though, in some that have been described by painters or historians, these marks have not been attended to, yet we can have no doubt that they are general to the whole tribe.

It is common enough to take these animals into gardens, as they are thought to destroy insects and snails in great abundance. We are even told that in hot countries, they are admitted into a domestic state, as they are great destroyers of bugs. How so large and heavy an animal is capable of being expert at such petty prey, is not easy to conceive; but I have seen several of them about gentlemen's houses, that, in general, appear torpid, harmless, and even fond of employment. Children have sometimes got upon the back of a tortoise; and such was the creature's strength, that it never seemed overloaded, but moved off with its burden to where it expected to be fed, but would carry them no further. In winter they regularly find out a place to sleep in; but in those warm countries in which the tortoise is found larger, and in greater plenty than in Europe, they live, without retiring, the whole year round.

The Sea Tortoise, or Turtle, as it is now called, is generally found larger than the former. This element is possessed with the property of increasing the magnitude of those animals, which are common to the land and the ocean. The sea pike is larger than that of fresh water; the sea bear is larger than that of the mountains; and the sea turtle exceeds the land tortoise in the same proportion. It is of different magnitudes, according to its different kinds; for some turtles being not above fifty pounds weight, and some above eight hundred.

The Great Mediterranean Turtle is the largest of the turtle kind with which we are acquainted. It is found from five to eight feet long, and from six to nine hundred pounds weight. But, unluckily, its utility bears no proportion to its size; as it is unfit for food, and sometimes poisons those who eat it. The shell also, which is a tough, strong integument, resembling a hide, is unfit for all serviceable purposes. One of these animals was taken in the year 1729, at the mouth of the Loire, in nets that were not designed for so large a capture. This turtle, which was of enormous strength, by its own struggles involved itself in the nets in such a manner as to be incapable of doing mischief: yet, even thus shackled, it appeared terrible to the fishermen, who were at first for flying; but finding it impotent, they gathered courage to drag it on shore, where it made a most horrible bellowing; and when they began to knock it on the head with their gaffs, it was to be heard at half a mile's distance. They were still further intimidated by its nauseous and pestilential breath, which so powerfully affected them, that they were near fainting. This animal wanted but four inches of being eight feet long, and was above two feet over: its shell more resembled leather than the shell of a tortoise; and, unlike all other animals of this kind, it was furnished with teeth in each jaw, one rank behind another, like those of a shark; its feet also, different from the rest of this kind, wanted claws; and the tail was quite disengaged from the shell, and fifteen inches long, more resembling that of a quadruped than a tortoise. This animal was then unknown upon the coasts of France, and was supposed to have been brought into the European seas, in some India ship that might be wrecked upon her return. Since that, however, two or three of these animals have been taken upon the coasts; two in particular upon those of Cornwall, in the year 1756, the largest of which weighed eight hundred pounds; and one upon the Isle of Rhe, but two years before, that weighed between seven and eight hundred. One, most probably of this kind also, was caught about thirty years ago near Scarborough: and a good deal of company was invited to feast upon it: a gentleman, who was one of the guests, told the company that it was a Mediterranean turtle, and not wholesome; but a person, who was willing to satisfy his appetite at the risk of his life, ate of it: he was seized with a violent vomiting and purging; but his constitution overpowered the malignity of the poison.

These are a formidable and useless kind, if compared to the turtle caught in the South Seas and the Indian Ocean. These are of different kinds; not only unlike each other in form, but furnishing man with very different advantages. They are usually distinguished by sailors into four kinds; the Trunk Turtle, the Loggerhead, the Hawksbill, and the Green Turtle.

The Trunk Turtle is commonly larger than the rest, and its back higher and rounder. The flesh of this is rank, and not very wholesome.

The Loggerhead is so called from the largeness of its head, which is much bigger in proportion than that of the other kinds. The flesh of this is also very rank, and not eaten but in case of necessity.

The Hawksbill Turtle is the least of the four, and has a long and small mouth, somewhat resembling the bill of a hawk. The flesh of this also is very indifferent eating; but the shell serves for the most valuable purposes. This is the animal that supplies the tortoise-shell, of which such a variety of beautiful trinkets are made. The substance of which the shells of other turtles are composed, is thin and porous but that of the hawksbill is firm, and when polished is beautifully marbled. They generally carry about three pounds; but the largest of all six pounds. The shell consists, as in all the kind, of thirteen leaves or plaits, of which eight are flat, and five hollow. They are raised and taken off by means of fire, which is made under the shell after the flesh is taken out. As soon as the heat affects the leaves, they start from the ribs, and are easily raised with the point of a knife. By being scraped and polished on both sides, they become beautifully transparent, or are easily cast into what form the workman thinks proper, by making them soft and pliant in warm water, and then screwing them in a mould, like a medal: however, the shell is most beautiful before it undergoes this last operation.

But of all animals of the tortoise kind, the green turtle is the most noted, and the most valuable. The delicacy of its flesh, and its nutritive qualities, together with the property of being easily digested, were for above a century known only to our seamen and the inhabitants of the coasts where they were taken. It was not till by slow degrees the distinction came to be made between such as were malignant and such as were wholesome. The controversies and contradictions of our old travellers were numerous upon this head: some asserting, that the turtle was delicious food: and others that it was actual poison. Dampier, that rough seaman, who has added more to natural history than half of the philosophers that went before him, appears to be the first who informed us of their distinctions; and that, while the rest might be valuable for other purposes, the green turtle alone was chiefly prized for the delicacy of its flesh. He never imagined, however, that this animal would make its way to the luxurious tables of Europe; for he seems chiefly to recommend it as salted up for ship's provision, in case of necessity.

At present the turtle is very well known among us, and is become the favourite food of those that are desirous of eating a great deal without the danger of surfeiting. This is a property the flesh of the turtle seems peculiarly possessed of; and by the importation of it alive among us, gluttony is freed from one of its greatest restraints. The flesh of the turtle is become a branch of commerce; and therefore ships are provided with conveniences for supplying them with water and provision, to bring them over in health from Jamaica and other West India islands. This, however, is not always effected; for though they are very vivacious, and scarce require any provision upon the voyage, yet, by the working of the ship, and their beating against the side of the boat that contains them, they become battered and lean; so that to eat this animal in the highest perfection, instead of bringing the turtle to the epicure, he ought to be transported to the turtle.

The animal is called the green turtle, from the colour of its shell, which is rather greener than that of others of this kind. It is generally found about two hundred weight; though some are five hundred, and others not above fifty. Dampier tells us of one that was seen at Port-Royal in Jamaica, that was six feet broad across the back; he does not tell us its other dimensions; but says, that the son of Captain Roach, a boy about ten years old, sailed in the shell, as in a boat, from the shore to his father's ship, which was a quarter of a mile from land. But this is nothing to the size of some turtles the ancients speak of. Ælian assures us, that the houses in the isle of Taprobane are usually covered with a single shell. Diodorus Siculus tells us, that a people neighbouring on Ethiopia, called the *Turtle-eaters*, coasted along the shore in boats made of the upper shell of this animal; and that in war, when they had eaten the flesh, the covering served them as a tent. In this account, Pliny, and all the rest of the ancients agree; and as they had frequent opportunities of knowing the truth, we are not lightly to contradict their testimony.

At present, however, they are not seen of such amazing dimensions. We are told, by Laet, that on the isle of Cuba they grow to such a size, as that five men can stand on the back of one of them; and, what is more surprising still, that the animal does not seem overloaded, but will go off with them upon its back, with a slow steady motion, towards the sea.

They are found in the greatest numbers on the island of Ascension; where, for several years, they were taken to be salted to feed the slaves, or for a supply of ship's provision. Their value at present seems to be better known.

This animal seldom comes from the sea but to deposit their eggs, and now and then to sport in fresh water. Its chief food is a submarine plant, that covers the bottom of several parts of the sea not far from the shore. There the turtles are seen, when the weather is fair, feeding in great numbers, like flocks of sheep, several fathoms deep upon the verdant carpet below. At other times they go to the mouths of rivers; and they seem to find gratification in fresh water. After some time thus employed, they seek their former stations: and when done feeding, they generally float with their heads above water, unless they are alarmed by the approach of hunters or birds of prey, in which case they suddenly plunge to the bottom. They often seek their provision among the rocks, feeding upon moss and sea-weed: and it is probable will not disdain to prey upon insects and other small animals, as they are very fond of flesh when taken and fed for the table.

At the time of breeding, they are seen to forsake their former haunts and their food, and to take sometimes a voyage of nine hundred miles to deposit their eggs on some favourite shore. The coasts they always resort to upon these occasions are those that are low, flat, and sandy; for being heavy animals, they cannot climb a bold shore; nor is any bed so proper as sand to lay their eggs on. They couple in March, and continue united till May; during a great part of which time they are seen locked together, and almost incapable of separation. The female seems passive and reluctant; but the male grasps her with his claws in such a manner, that nothing can induce him to quit his hold. It would seem that the grasp, as in frogs, is in some measure convulsive, and that the animal is unable to relax its efforts.

When the time for laying approaches, the female is seen towards the setting of the sun drawing near the shore, and looking earnestly about her, as if afraid of being discovered. When she perceives any person on shore, she seeks for another place; but if otherwise, she lands when it is dark, and goes to take a survey of the sand where she designs to lay. Having marked the spot, she goes back without laying for that night, to the ocean again. but the next night returns to deposit a part of her burden. She begins by working and digging in the sand with her fore-feet till she has made a round hole, a foot broad and a foot and a half deep, just at the place a little above where the water reaches highest. This done, she lays eighty or ninety eggs at a time, each as big as a hen's egg, and as round as a ball. She continues laying about the space of an hour; during which time, if a cart were driven over her, she would not be induced to stir.—The eggs are covered with a tough white skin, like wetted parchment. When she has done laying she covers the hole so dexterously, that it is no easy matter to find the place;

and those must be accustomed to the search to make the discovery. When the turtle has done laying she returns to the sea, and leaves her eggs to be hatched by the heat of the sun. At the end of fifteen days she lays about the same number of eggs again; and at the end of another fifteen days she repeats the same: three times in all, using the same precautions every time for their safety.

In about twenty-four or twenty-five days after laying, the eggs are hatched by the heat of the sun; and the young turtles, being about as big as quails, are seen bursting from the sand, as if earth-born, and running directly to the sea, with instinct only for their guide: but to their great misfortune, it often happens that, their strength being small, the surges of the sea, for some few days, beat them back upon the shore. Thus exposed, they remain a prey to thousands of birds that then haunt the coasts; and these stooping down upon them, carry off the greatest part, and sometimes the whole brood, before they have strength sufficient to withstand the waves, or dive to the bottom. Helbigius informs us, that they have still another enemy to fear, which is no other than the parent that produced them, that waits for their arrival at the edge of the deep, and devours as many as she can. This circumstance, however, demands further confirmation; though nothing is more certain than that the crocodile acts in the same unnatural manner.

When the turtles have done laying, they then return to their accustomed places of feeding. Upon their out-set to the shore, where they breed, they are always found fat and healthy; but upon their return, they are weak, lean, and unfit to be eaten. They are seldom, therefore, molested upon their retreat; but the great art is to seize them when arrived, or to intercept their arrival. In these uninhabited islands, to which the green turtle chiefly resorts, the men that go to take them land about night-fall, and without making any noise (for those animals, though without any external opening of the ear, hear very distinctly, there being an auditory conduit that opens into the mouth) lie close while they see the female turtle coming on shore. They let her proceed to her greatest distance from the sea; and then, when she is most busily employed in scratching a hole in the sand, they sally out and surprise her. Their manner is to turn her upon her back, which utterly incapacitates her from moving; and yet, as the creature is very strong, and struggles very hard, two men find it no easy matter to lay her over. When thus secured they go to the next; and in this manner, in less than three hours, they have been known to turn forty or fifty turtles, each of which weighs from a hundred and fifty to two hundred pounds. Labat assures us, that when the animal is in this helpless situation, it is heard to sigh very heavily, and even to shed tears.

At present, from the great appetite that man has discovered for this animal, they are not only thinned in their numbers, but are also grown much more shy. There are several other ways, therefore, contrived for taking them. One is, to seize them when coupled together, at the breeding season, when they are very easily approached, and as easily seen; for these animals, though capable of living for some time under water, yet rise every eight or ten minutes to breathe. As soon as they are thus perceived, two or three people draw near them in a canoe, and slip a noose either round their necks or one of their feet. If they have no line, they lay hold of them by the neck, where they have no shell, with their hands only; and by this means they usually catch them both together. But sometimes the female escapes, being more shy than the male.

Another way of taking them is by the harpoon, either when they are playing on the surface of the water, or feeding at the bottom;—when the harpoon is skilfully darted, it sticks fast in the shell of the back; the wood then disengages from the iron, and the line is long enough for the animal to take its range: for if the harpooner should attempt at once to draw the animal into his boat till it is weakened by its own struggling, it would probably get free. Thus the turtle struggles hard to get loose, but all in vain; for they take care the line fastened to the harpoon shall be strong enough to hold it.

There is yet another way which, though seemingly awkward, is said to be attended with very great success. A good diver places himself at the head of the boat; and when the turtles are observed, which they sometimes are in great numbers, asleep on the surface, he immediately quits the vessel, at about fifty yards distance, and keeping still under water, directs his passage to where the turtle was seen, and coming up beneath, seizes it by the tail; the animal awaking struggles to get free; and by this both are kept at the surface until the boat arrives to take them in.

CHAPTER IV.

OF THE SHELL OF TESTACEOUS FISHES.

ONE is apt to combine very dissimilar objects in the same group, when hurried into the vortex of method. No two animals are more unlike each other than the whale and the limpet, the tortoise and the oyster. Yet, as these animals must find some place in the picture of Animated Nature, it is best to let them rest in the station where the generality of mankind have assigned them; and as they have been willing to give them all from their abode the name of fishes, it is wisest in us to conform.

But before I enter into any history of shell-fish, it may not be improper to observe, that naturalists who have treated on this part of history, have entirely attended to outward forms; and, as in many other instances, forsaking the description of the animal itself, have exhausted all their industry in describing the habitation. In consequence of this radical error, we have volumes written upon the subject of shells, and very little said on the history of shell-fish. The life of these industrious creatures, that for the most part creep along the bottom, or immoveably wait till driven as the waves happen to direct, is almost entirely unknown. The wreathing of their shells, or the spots with which they are tinctured, have been described with a most disgusting prolixity; but their appetites and their combats, their escapes and humble arts of subsistence, have been utterly neglected.

As I have only undertaken to write the history of Animated Nature, the variety of shells, and their peculiar spots or blemishes, do not come within my design. However, the manner in which shells are formed is a part of natural history connected with my plan, as it pre-supposes vital force or industry in the animal that forms them.

The shell may be considered as a habitation supplied by Nature. It is a hard stony substance, made up somewhat in the manner of a wall. Part of the stony substance the animal derives from outward objects, and the fluids of the animal itself furnish the cement. These united make that firm covering which shell-fish generally reside in till they die.

But in order to give a more exact idea of the manner in which sea-shells are formed, we must have recourse to an animal that lives upon land, with the formation of whose shell we are best acquainted. This is the garden-snail, that carries its box upon its back, whose history Swammerdam has taken such endless pains to describe. As the manner of the formation of this animal's shell extends to that of all others that have shells, whether they live upon land or in the water, it will be proper to give it a place before we enter upon the history of testaceous fishes.

To begin with the animal in its earliest state, and trace the progress of its shell from the time it first appears:—The instant the young snail leaves the egg, it carries its shell or its box on its back. It does not leave the egg till it is arrived at a certain growth, when its little habitation is sufficiently hardened. This beginning of the shell is not much bigger than a pin's head, but grows in a very rapid manner, having at first but two circumvolutions, for the rest are added as the snail grows larger. In proportion as the animal increases in size, the circumvolutions of the shell increase also, until the number of those volutes come to be five, which is never exceeded.

The part where the animal enlarges its shell is at the mouth, to which it adds in proportion as it finds itself stinted in its habitation below. Being about to enlarge its shell, it is seen with its little teeth biting and clearing away the scaly skin that grows at the edges. It is sometimes seen to eat those bits it thus takes off; at other times it only cleans away the margin when covered with films, and then adds another rim to its shell.

For the purpose of making the shell, which is natural to the animal, and without which it could not live three days, its whole body is furnished with glands, from the orifices of which flows out a kind of slimy fluid, like small spiders' threads, which join together in one common crust or surface, and in time condense and acquire a stony hardness. It is this slimy humour that grows into a membrane, and afterwards a stony skin; nor can it have escaped any who have observed the track of a snail, that glistening substance which it leaves on the floor or the wall, is no other than the materials with which the animal adds to its shell, or repairs it when broken.

Now to exhibit in a more satisfactory manner the method in which the shell is formed.—The snail bursts from its egg with its shell upon its back; this shell, though very simple, is the centre round which every succeeding convolution of the shell is formed, by new circles added to the first. As the body of the snail can be extended no where but to the aperture, the mouth of the shell only can, of consequence, receive augmentation. The substance of which the shell is composed is chiefly supplied by the animal itself, and is no more than a slimy fluid which hardens into bone. This fluid passes through an infinite number of little glands till it arrives at the pores of the skin; but there it is stopped by the shell that covers the part below; and therefore is sent to the mouth of the shell, where it is wanted for its enlargement. There the first layer of slime soon hardens; and then another is added, which hardens also, till in time the shell becomes as thick as is requisite for the animal's preservation. Thus every shell may be considered as composed of a number of layers of slime, which have entirely proceeded from the animal's own body.

But though this be the general opinion with regard to the formation of shells, I cannot avoid thinking there are still other substances besides the animal's own slime which go to the composition of its shell, or at least to its external coat, which is ever different from the internal. The substances I mean are the accidental concretions of earthy or saline parts, which adhere to the slimy matter upon its first emission. By adopting this theory, we can more satisfactorily account for the various colours of the shell, which cannot be supposed to take its tincture from the animal's body, as is the usual opinion; for all the internal parts of the shell are but of one white colour; it is only the outermost layer of the shell that is so beautifully varied, so richly tinctured with that variety of colours we behold in the cabinets of the curious. If the external coat be scaled off, as Mr. Angenville asserts, all the inner substance will be found but of one simple colouring; and consequently the animal's own juices can give only one colour; whereas we see some shells stained with a hundred.

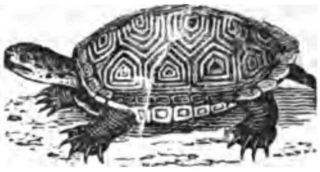
The usual way of accounting for the different colouring of shells, which seems to me erroneous, is this: in the body of every one of these animals, several streaks are discerned of a different colour from the rest. "This variety," say they, "is an incontestible proof that the juices flowing from those parts will be also of a different hue; and will consequently tinge that part of the shell which their slime composes of a different colour." But this system, as was observed before, is overthrown by the fact, which discovers that only the outer surface of the shell is tinged; whereas by this it would have been coloured throughout; nay, by this system, the internal parts of the shell would be stained with the most vivid colouring, as being least exposed to the external injuries of the elements where it is placed. But the truth is, the animal residing in the shell has none of these various colours thus talked of: its slime is a simple, pellucid substance; and the only marblings which appear in its body, are the colour of the food which is seen through its transparent intestines. We must, therefore, account for the various colouring of its shell upon a different principle.

If, as I said, we examine the cabinets of the curious, we shall find shells with various and beautiful colouring: we shall find them generally furnished with a white ground, tinctured with red, yellow, brown, green, and several other shades and lovely mixtures, but never blue. Shells are of almost all colours but blue. The reason seems to be obvious; for blue is the colour which sea-water changes. A piece of silk, or a feather, of this colour, put into an infusion of salt, urine, or nitre, lose their tint entirely. Now, may not this give us a hint with respect to the operation of Nature in colouring her shells? May we not from hence conclude, that sea-water is efficacious in giving colour or taking it away? That, to produce colour, the animal not only furnishes its juices, but the sea or the earth that mixture of substance which is to unite with them. Neither the animal slime alone, nor the external earthy or saline substances alone, could produce colours; but both united, produce an effect which neither separately were possessed of. Thus shells assume every colour but blue; and that sea-water, instead of producing, would be apt to destroy.

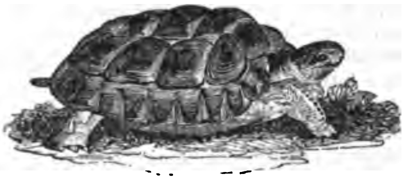
From hence, therefore, it appears, that the animal does not alone tincture its own shell; but that external causes co-operate in contributing to its beauty. It is probable, that, from the nature of its food, or from other circumstances unknown to us, the external layers of its slime may be of different consistencies; so as, when joined with the particles of earth or salt that are accidentally united with them from without, they assume various and beautiful hues. But the internal layers, which receive no foreign admixture, still preserve the natural colour of the animal, and continue white without any variation.

Thus far we see that the animal is not wholly the agent in giving beauty and colouring to its shell: but it seems otherwise with respect to its convolutions, its prominences, and general form. These entirely depend upon the art of the animal; or rather upon its instincts; which, in the same kinds, are ever invariable. The shell generally bears some rude resemblance to the body upon which it has been moulded. Thus it is observable in all sea-shells, that if the animal has any tumour or excrescence on its body, it creates likewise a swelling in that part of the incrustation to which it corresponds. When the animal begins to alter its position, and to make new additions to its apartments, the same protuberance which had raised the shell before in one part, swells it again at some little distance; by which means we see the same inequality, in a spiral line, all round the shell. Sometimes these tumours of the animal are so large, or so pointed, that those which rise over them in the incrustation, appear like horns: after this the animal disengages itself from its first cavities, and then, by fresh evacuations, assumes a new set of horns; and so increases the number in proportion to its growth. If, on the other hand, the body happens to be channelled, the shell that covers it will be channelled likewise; if there be any protuberances in the body, which wind in a spiral line about it, the shell will likewise have its tumours and cavities winding round to the end.

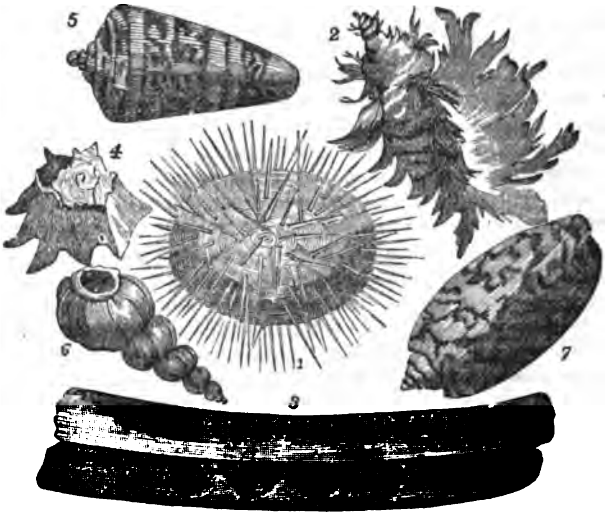
In this manner, as the animals are of various forms, the shells exhibit an equal variety. Indeed, the diversity is so great and the figures and colours so very striking, that several persons, with a kind of harmless indolence, have made the arrangement of them the study and the business of their lives. Those who consult their beauty alone, take care to have them polished, and to have an external crust, or periosteum, as Swammerdam calls it, scoured off from their surfaces by spirit of salt. But there are others that, with more learned affectation, keep them exactly in the state in which they have been found, with their precious crust still round them. The expense men have sometimes been at in making such collections, is amazing; and some shells, such as the Stair-shell, or the Admiral-shell, are not more precious for their scarceness, than pearls are for their beauty. Indeed, it is the scarcity, and not the beauty of the object, that determines the value of all natural curiosities. Those shells that offer but little beauty to the ignorant, are often the most precious; and those shells which an unlearned spectator would stop to observe with admiration, one accustomed to the visitation of cabinets, would pass over with disdain.—These collections, however, have their use; not only by exhibiting the vast variety of Nature's operations, but also by exciting our curiosity to the consideration of the animals that form them. A mind that can find innocent entertainment in these humble contemplations is well employed; and, as we say of children, is kept from doing mischief. Although there may be nobler occupations than that of considering the convolutions of a shell, yet there may be some who want the ambition to aspire after such arduous pursuits; there may be some unfit for them; there



Land Tortoise, p. 14.



Great Land Tortoise, p. 14.



Testaceous Fishes, p. 23 to 47.

1. Sea Urchin. 2. Purple Fish. 3. Razor, or Sabre Fish. 4. Cochlea.
5. Voluta, or Scroll-shaped. 6. Turbo, or Twisted. 7. Cylindrus, or Cylindrical.

To face p. 26, vol. iv.

may be some who find their ambition fully gratified by the praise which the collectors of shells bestow upon each other. Indeed, for a day or two, there is no mind that a cabinet of shells cannot furnish with pleasing employment. "What can be more gratifying," as Pliny says,* "than to view Nature in all her irregularities, and sporting in her variety of shells! Such a difference of colour do they exhibit! such a difference of figure! flat, concave, long, lunated, drawn round in a circle, the orbit cut in two! some are seen with a rising on the back, some smooth, some wrinkled, toothed, streaked, the point variously intorted, the mouth pointing like a dagger, folded back, bent inwards! all these variations, and many more, furnish at once novelty, elegance, and speculation."

With respect to the figure of shells, Aristotle has divided them into three kinds: and his method is, of all others, the most conformable to Nature. These are, first, the *univalve*, or *turbinated*, which consist of one piece, like the box of a snail; secondly, the *bivalve*, consisting of two pieces, united by a hinge. like an oyster; and, thirdly, the *multivalve*, consisting of more than two pieces, as the acorn-shell, which has not less than twelve pieces that go to its composition. All these kinds are found in the sea at different depths, and are valuable in proportion to their scarceness or beauty.

From the variety of the colours and figure of shells, we may pass to that of their place and situation. Some are found in the sea; some in fresh-water rivers; some alive upon land; and a still greater quantity dead in the bowels of the earth. But wherever shells are found, they are universally known to be composed of one and the same substance. They are formed of an animal or calcareousearth, that ferments with vinegar and other acids, and that burns into lime, and will not easily melt into glass. Such is the substance of which they are composed; and of their spoils, many philosophers think that a great part of the surface of the earth is composed at present. It is supposed by them, that chalks, marls, and all such earths as ferment with vinegar, are nothing more than a composition of shells decayed, and crumbled down to one uniform mass.

Sea-shells are either found in the depths of the ocean, or they are cast empty and forsaken of their animals upon shore. Those which are fished up from the deep, are called by the Latin name *Pelagii;* those that are cast upon shore, are called *Littorales*. Many of the pelagii are never seen upon shore; they continue in the depths where they are bred; and we owe their capture only to accident. These, therefore, are the most scarce shells, and consequently the most valuable. The littorales are more frequent, and such as are of the same kind with the pelagii are not so beautiful. As they are empty and forsaken, and as their animal is dead, and perhaps putrid in the bottom of the shell, they by this means lose the whiteness and the brilliancy of their colouring. They are not unfrequently also found eaten through, either by worms or by each other; and they are thus rendered less valuable: but what decreases their price still more is, when they are scaled and worn by lying too long empty at the bottom, or exposed upon the shore. Upon the whole, however, sea-shells exceed either land or fossil shells in beauty; they receive the highest polish, and exhibit the most brilliant and various colouring.

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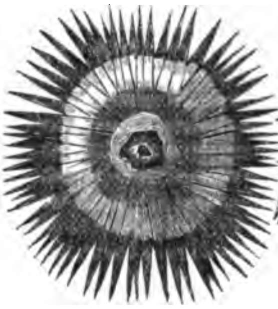
* Plin. ix. 33.

Fresh-water shells are neither so numerous, so various, nor so beautiful as those belonging to the sea. They want that solidity which the others have; their *clavicle*, as it is called, is neither so prominent nor so strong; and not having a saline substance to tinge the surface of the shell, the colours are obscure. In fresh-water there are but two kinds of shells, namely, the bivalved and the turbinated.

Living land shells are more beautiful, though not so various as those of fresh-water; and some not inferiour to sea-shells in beauty. There are, indeed, but of one kind, namely, the turbinated; but in that there are found four or five very beautiful varieties.

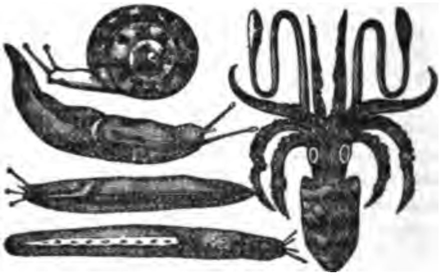
Of fossil, or, as they are called, *extraneous* shells, found in the bowels of the earth, there are great numbers, and as great a variety. In this class there are as many kinds as in the sea itself. There are found there turbinated, the bivalve, and the multivalve kinds; and of all these, many at present not to be found even in the ocean. Indeed, the number is so great, and the varieties so many, that it was long the opinion of naturalists, that they were merely the capricious productions of Nature, and had never given retreat to animals whose habitations they resembled. They were found, not only of various kinds, but in different states of preservation: some had the shell entire, composed, as in its primitive state, of a white calcareous earth, and filled with earth, or even empty; others were found with the shell entire, but filled with a substance which was petrified by time; others, and these in great numbers, were found with the shell entirely mouldered away, but the petrified substance that filled it still exhibiting the figure of the shell; others still, that had been lodged near earth or stone, impressed their print upon these substances, and left the impression, though they themselves were decayed: lastly, some shells were found half mouldered away, their parts scaling off from each other in the same order in which they were originally formed. However these different stages of the shell, and even their fermenting with acids, were at first insufficient to convince those who had before assigned them a different origin. They were still considered as accidentally and sportively formed, and deposited in the various repositories where they were found, but no way appertaining to any part of Animated Nature. This put succeeding inquirers upon more minute researches; and they soon began to find, that often where they dug up petrified shells or teeth, they could discover the petrified remains of some other bony parts of the body. They found that the shells which were taken from the earth. exhibited the usual defects and mischances, which the same kind are known to receive at sea. They showed them not only tinctured with a salt-water crust, but pierced in a peculiar manner by the sea worms, that make the shells of fishes their favourite food. These demonstrations were sufficient at last to convince all but a few philosophers who died away, and whose erroneous systems died with them.

Every shell, therefore, wherever it is found, is now considered as the spoil of some animal, that once found shelter therein. It matters not by what unaccountable means they may have wandered from the sea; but they exhibit all, and the most certain marks of their origin. From their numbers and situation, we are led to conjecture, that the sea reached the places where they are found; and from their varieties, we learn how little we know of all the sea contains at present; as the earth furnishes many kinds which our most exact and industrious shell-collectors have not been able to

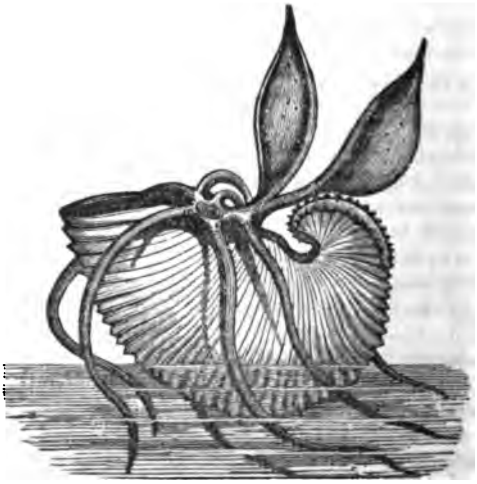


Sea Marygold, p. 20.

Rose-coloured Anemone, p. 22.



Cuttlefish and different species of Mollusca or Testaceous Fishes, p. 23 to 47.



Nautilus, with the living animal, p. 35.

To face p. 22, vol. iv.

fish up from the deep. It is most probable that thousands of different forms still remain at the bottom unknown; so that we may justly say with the philosopher: *Ea quæ scimus sunt pars minima eorum quæ ignoramus.*

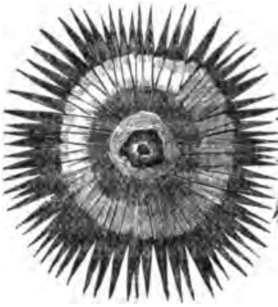
It is well, however, for mankind, that the defect of our knowledge on this subject is of all parts of learning, that which may be most easily dispensed with. An increase in the number of shells, would throw but very few lights upon the history of the animals that inhabit them. For such information we are obliged to those men who contemplated something more than the outside of the objects before them. To Reaumur we are obliged for examining the manners of some with accuracy; but to Swammerdam for more. In fact, this Dutchman has lent attentions to those animals, that almost exceed credibility: he has excelled even the insects he dissected, in patience, industry, and perseverance. It was in vain that this poor man's father dissuaded him from what the world considered as a barren pursuit; it was in vain that an habitual disorder, brought on by his application, interrupted his efforts; it was in vain that mankind treated him with ridicule while living, as they suffered his works to remain long unprinted and neglected when dead; still the Dutch philosopher went on, peeping into unwholesome ditches, wading through fens, dissecting spiders, and enumerating the blood-vessels of a snail; like the bee, whose heart he could not only distinguish, but dissect, he seemed instinctively impelled by his ruling passion, although he found nothing but ingratitude from man, and though his industry was apparently becoming fatal to himself. From him I will take some of the leading features in the history of those animals which breed in shells; previously taking my division from Aristotle, who, as was said above, divides them into three classes: the Turbinated, or those of the Snail kind; the Bivalved, or those of the Oyster kind; and the Multivalved, or those of the Acorn-shell kind. Of each I will treat in distinct chapters.

CHAPTER V.

OF TURBINATED SHELL-FISH OF THE SNAIL KIND.

TO conceive the manner in which those animals subsist that are hid from us at the bottom of the deep, we must again have recourse to one of a similar nature and formation, that we know. The history of the garden-snail has been more copiously considered than that of the elephant; and its anatomy is as well, if not better known: however, not to give any one object more room in the general picture of Nature than it is entitled to, it will be sufficient to observe, that the snail is surprisingly fitted for the life it is formed to lead. It is furnished with the organs of life in a manner almost as complete as the largest animal; with a tongue, brain, salival ducts, glands, nerves, stomach, and intestines; liver, heart, and blood vessels: besides this, it has a purple bag that furnishes a red matter to different parts of the body, together with strong muscles that hold it to the shell, and which are hardened like tendons, at their insertion.

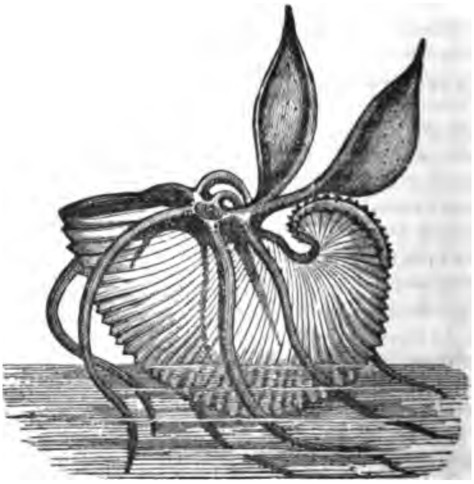
But these it possesses in common with other animals. We must now see what it has peculiar to itself. The first striking peculiarity is, that the animal has got its eyes on the points of its largest horns. When the snail



Sea Marygold, p. 230.

Rose-coloured Anemone, p. 228.

Cutlefish and different species of Mollusca or Testaceous Fishes, p. 23 to 47.



Nautilus, with the living animal, p. 35.

To face p. 29, vol. iv.

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But these it possesses in common with other animals. We must now see what it has peculiar to itself. The first striking peculiarity is, that the animal has got its eyes on the points of its largest horns. When the snail is in motion, four horns are distinctly seen; but the two uppermost and longest deserve peculiar consideration, both on account of the various motions with which they are endued, as well as their having their eyes fixed at the extreme ends of them. These appear like two blackish points at their ends. When considered as taken out of the body, they are of a bulbous or turnip-like figure; They have but one coat; and the three humours which are common in the eyes of other animals, namely, the vitreous, the aqueous, and the chrystalline, are in these very indistinctly seen. The eyes the animal can direct to different objects at pleasure, by a regular motion out of the body; and sometimes it hides them, by a very swift contraction into the belly. Under the small horns is the animal's mouth; and though it may appear too soft a substance to be furnished with teeth, yet it has not less than eight of them, with which it devours leaves and other substances, seemingly harder than itself; and with which it sometimes bites off pieces of its own shell.

But what is most surprising in the formation of this animal, are the parts that serve for generation. Every snail is at once male and female; and while it impregnates another, is itself impregnated in turn. The vessels supplying the fluid for this purpose, are placed chiefly in the forepart of the neck, and extend themselves over the body; but the male and female organs of generation, are always found united, and growing together. There is a large opening on the right side of the neck, which serves for very different purposes. As an anus it gives a passage to the excrements; as a mouth it serves for an opening for a respiration; and also as an organ of generation, it dilates when the desire of propagation begins. Within this each animal has those parts, or something similar thereto, which continue the kind.

For some days before coition, the snails gather together, and lie quite near each other, eating very little in the mean time; but they settle their bodies in such a posture, that the neck and head are placed upright. In the mean time, the apertures on the side of the neck being greatly dilated, two organs, resembling intestines, are seen issuing from them, which some have thought to be the instruments of generation. Beside the protrusion of these, each animal is possessed of another peculiarity; for, from the same aperture, they launch forth a kind of dart at each other, which is pretty hard, barbed, and ending in a very sharp point. This is performed when the apertures approach each other; and then the one is seen to shoot its weapon, which is received by the other, though it sometimes falls to the ground; some minutes after, the snail which received the weapon, darts one of its own at its antagonist, which is received in like manner. They then softly approach still nearer, and apply their bodies one to the other, as closely as the palms and fingers of the hands, when grasped together. At that time the horns are seen variously moving in all directions; and this sometimes for three days together. The coupling of these animals is generally thrice repeated, at intervals of fifteen days each; and, at every time, a new dart is mutually emitted.

At the expiration of eighteen days, the snails produce their eggs, at the opening of the neck, and hide them in the earth with the greatest solicitude and industry. These eggs are in great numbers, round, white, and covered with a soft shell: they are also stuck to each other by an imperceptible slime, like a bunch of grapes, of about the size of a small pea.

When the animal leaves the egg, it is seen with a very small shell on its back, which has but one convolution; but in proportion as it grows, the shell increases in the number of its circles. The shell always receives its additions at the mouth; the first centre still remaining; the animal sending forth from its body that slime which hardens into a stony substance, and still is fashioned into similar volutions. The garden-snail seldom exceeds four rounds and a half; but some of the sea-snails arrive even at ten.

The snail, thus fitted with its box, which is light and firm, finds itself defended in a very ample manner from all external injury. Whenever it is invaded, it is but retiring into this fortress, and waiting patiently till the danger is over. Nor is it possessed only of a power of retreating into its shell, but of mending it when broken. Sometimes these animals are crushed seemingly to pieces; and, to all appearance, utterly destroyed: yet still they set themselves to work, and, in a few days, mend all their numerous breaches. The same substance by which the shell is originally made, goes to the re-establishment of the ruined habitation. But all the junctures are very easily seen, for they have a fresher colour than the rest, and the whole shell in some measure resembles an old coat, patched with new pieces. They are sometimes seen with eight or ten of these patches; so that the damage must have been apparently irreparable. Still, however, though the animal is possessed of the power of mending its shell, it cannot, when come to its full growth, make a new one. Swammerdam tried the experiment: he stripped a snail of its shell, without hurting any of the blood-vessels, retaining that part of the shell where the muscles were inserted; but it died in three days after it was stripped of its covering: not, however, without making efforts to buıld up a new shell; for, before its death, it pressed out a certain membrane round the whole surface of its body. This membrane was entirely of the shelly nature, and was intended, by the animal, as a supply towards a new one.

As the snail is furnished with all the organs of life and sensation, it is not wonderful to see it very voracious. It chiefly subsists upon the leaves of plants and trees; but is very delicate in its choice. When the animal moves to seek its food, it goes forward by means of that broad muscular skin which is sometimes seen projecting round the mouth of the shell; this is expanded before, and then contracted with a kind of undulating motion, like a man attempting to move himself forward by one arm, while lying on his belly. But the snail has another advantage, by which it not only smooths and planes its way, but also can ascend in the most perpendicular direction. This is by that slimy substance with which it is so copiously furnished, and which it emits wherever it moves. Upon this slime, as upon a kind of carpet, it proceeds slowly along, without any danger of wounding its tender body against the asperites of the pavement; by means of this it moves upwards to its food upon trees; and by this descends without danger of falling, and breaking its shell by the shock.

The appetite of these animals is very great; and the damage gardeners in particular sustain from them, makes them employ every method for their destruction. Salt will destroy them, as well as soot; but a tortoise in a garden is said to banish them much more effectually.

At the approach of winter, the snail buries itself in the earth; or retires to some hole, to continue in a torpid state, during the severity of the season. It is sometimes seen alone; but more frequently in company in its retreats several being usually found together, apparently deprived of life and sensation. For the purposes of continuing in greater warmth and security, the snail forms a cover or lid to the mouth of its shell with its slime, which stops it up entirely, and thus protects it from every external danger. The matter of which the cover is composed, is whitish, somewhat like plaster, pretty hard and solid, yet at the same time porous and thin, to admit air, which the animal cannot live without. When the cover is formed too thick, the snail then breaks a little hole in it, which corrects the defect of that closeness, which proceeded from too much caution. In this manner, sheltered in its hole from the weather, defended in its shell by a cover, it sleeps during the winter; and, for six or seven months, continues without food or motion, until the genial call of spring breaks its slumber, and excites its activity.

The snail, having slept for so long a season, wakes one of the first fine days of April, breaks open its cell, and sallies forth to seek for nourishment. It is not surprising that so long a fast should have thinned it, and rendered it very voracious. At first, therefore, it is not very difficult in the choice of its food; almost any vegetable that is green seems welcome; but the succulent plants of the garden are chiefly grateful; and the various kinds of pulse are, at some seasons, almost wholly destroyed by their numbers. So great is the multiplication of snails in some years, that gardeners imagine they burst from the earth. A wet season is generally favourable to their production; for this animal cannot bear very dry seasons, or dry places, as they cause too great a consumption of its slime, without plenty of which it cannot subsist in health and vigour.

Such are the most striking particulars in the history of this animal; and this may serve as a general picture, to which the manners and habitudes of the other tribes of this class may be compared and referred. These are, the sea snail, of which naturalists have, from the apparent difference of their shells, mentioned fifteen kinds;* the fresh-water snail, of which there are eight kinds; and the land-snail, of which there are five. These all bear a strong resemblance to the garden-snail, in the formation of their shell, in their hermaphrodite natures, in the slimy substance with which they are covered, in the formation of their intestines, and the disposition of the hole on the right side of the neck, which serves at once for the discharge of the faeces, for the lodging the instruments of generation, and for respiration, when the animal is under a necessity of taking in a new supply.

But in Nature, no two kinds of animals, however like each other in figure or conformation, are of manners entirely the same. Though the common garden-snail bears a very strong resemblance to that of the fresh-water, and that of the sea, yet there are differences to be found, and those very considerable ones.

If we compare them with the fresh-water snail, though we shall find a general resemblance, yet there are one or two remarkable distinctions; and first, the fresh-water snail, and, as I should suppose, all snails that live in water, are peculiarly furnished with a contrivance by Nature, for rising to the surface, or sinking to the bottom. The manner in which this is performed, is by opening and shutting the orifice on the right side of the neck, which is furnished with muscles for that purpose. The snail sometimes gathers this aperture into an oblong tube, and stretches or protends it above the surface of the water, in order to draw in or expel the air as it finds occasion. This may not only be seen, but heard also by the noise which the snail makes in moving the water. By dilating this it rises, by compressing it the animal sinks to the bottom. This is effected somewhat in the manner in which little images of glass are made to rise or sink in water, by pressing the air contained at the mouth of the tubes, so that it shall drive the water into their hollow bodies, which before were filled only with air, and thus make them heavier than the element in which they swim. In this manner does the fresh-water snail dive or swim, by properly managing the air contained in its body.

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* D'Argenville's Conchyliology

But what renders these animals far more worthy of notice is, that they are viviparous, and bring forth their young not only alive, but with their shells upon their backs. This seems surprising: yet it is incontestibly true! the young come to some degree of perfection in the womb of the parent; there they receive their stony coat; and from thence are excluded, with a complete apparatus for subsistence.

"On the twelfth of March," says Swammerdam, "I began my observations upon this snail, and collected a great number of the kind, which I put into a large basin filled with rain-water, and fed for a long time with potter's earth, dissolved in the water about them. On the thirteenth of the same month I opened one of these snails, when I found nine living snails in its womb: the largest of these were placed foremost, as the first candidates for exclusion. I put them into fresh-water, and they lived till the eighteenth of the same month, moving and swimming, like snails full grown; nay, their manner of swimming was much more beautiful." Thus, at whatever time of the year these snails are opened, they are found pregnant with eggs, or with living snails; or with both together.

This striking difference between the fresh-water and the garden-snail, obtains also in some of the sea kind; among which there are some that are found viviparous, while others lay eggs in the usual manner. Of this kind are one of the two Buccinums; within which living young have been frequently found, upon their dissection. In general, however, the rest of this numerous class bring forth eggs; from whence the animal bursts at a proper state of maturity, completely equipped with a house, which the moistness of the element where it resides does not prevent the inhabitant from enlarging. How the soft slime of the snail hardens, at the bottom of the sea, into the stony substance of a shell, is not easy to conceive! This slime must at least be possessed of very powerful petrifying powers.

All animals of the snail kind, as was observed before, are hermaphrodites; each containing the instruments of generation double. But some of the sea kinds copulate in a different manner from those of the garden. The one impregnates the other; but, from the position of the parts, is incapable of being impregnated by the same in turn. For this reason it is necessary for a third to be admitted as a partner in this operation: so that, while one impregnates that before it, another does the same office by this; which is itself impregnated by a fourth. In this manner, Mr. Adanson has seen vast numbers of sea-snails united together in a chain, impregnating each other. The Burlin and Coret perform the offices of male and female at the same time. The orifices in these are two, both separate from each other: the opening by which the animal performs the office of the male, being at the origin of the horns; that by which it is passive, as the female, being farther down

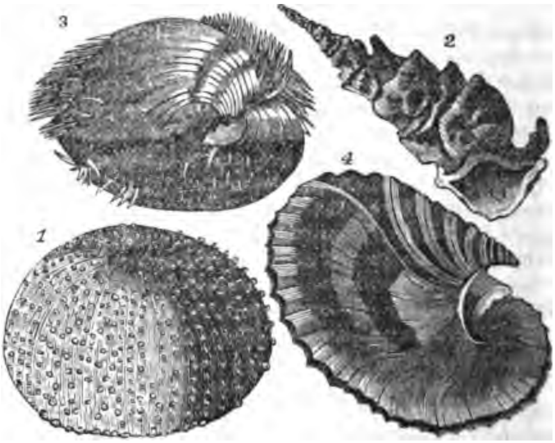
Fresh-water shells are neither so numerous, so various, nor so beautiful as those belonging to the sea. They want that solidity which the others have; their *clavicle*, as it is called, is neither so prominent nor so strong; and not having a saline substance to tinge the surface of the shell, the colours are obscure. In fresh-water there are but two kinds of shells, namely, the bivalved and the turbinated.

Living land shells are more beautiful, though not so various as those of fresh-water; and some not inferiour to sea-shells in beauty. There are, indeed, but of one kind, namely, the turbinated; but in that there are found four or five very beautiful varieties.

Of fossil, or, as they are called, *extraneous* shells, found in the bowels of the earth, there are great numbers, and as great a variety. In this class there are as many kinds as in the sea itself. There are found there turbinated, the bivalve, and the multivalve kinds; and of all these, many at present not to be found even in the ocean. Indeed, the number is so great, and the varieties so many, that it was long the opinion of naturalists, that they were merely the capricious productions of Nature, and had never given retreat to animals whose habitations they resembled. They were found, not only of various kinds, but in different states of preservation: some had the shell entire, composed, as in its primitive state, of a white calcareous earth, and filled with earth, or even empty; others were found with the shell entire, but filled with a substance which was petrified by time; others, and these in great numbers, were found with the shell entirely mouldered away, but the petrified substance that filled it still exhibiting the figure of the shell; others still, that had been lodged near earth or stone, impressed their print upon these substances, and left the impression, though they themselves were decayed: lastly, some shells were found half mouldered away, their parts scaling off from each other in the same order in which they were originally formed. However these different stages of the shell, and even their fermenting with acids, were at first insufficient to convince those who had before assigned them a different origin. They were still considered as accidentally and sportively formed, and deposited in the various repositories where they were found, but no way appertaining to any part of Animated Nature. This put succeeding inquirers upon more minute researches; and they soon began to find, that often where they dug up petrified shells or teeth, they could discover the petrified remains of some other bony parts of the body. They found that the shells which were taken from the earth, exhibited the usual defects and mischances, which the same kind are known to receive at sea. They showed them not only tinctured with a salt-water crust, but pierced in a peculiar manner by the sea worms, that make the shells of fishes their favourite food. These demonstrations were sufficient at last to convince all but a few philosophers who died away, and whose erroneous systems died with them.

Every shell, therefore, wherever it is found, is now considered as the spoil of some animal, that once found shelter therein. It matters not by what unaccountable means they may have wandered from the sea; but they exhibit all, and the most certain marks of their origin. From their numbers and situation, we are led to conjecture, that the sea reached the places where they are found; and from their varieties, we learn how little we know of all the sea contains at present; as the earth furnishes many kinds which our most exact and industrious shell-collectors have not been able to

Land Tortoise, p. 14.



1. Turban Urchin.
2. Turbo, or Twisted.
3. Heart-shaped.
4. Argonauta Argo, or Nautilus.

Snail, p. 30.

Starfish, p. 214.

To face p. 37 vol. iv.

animals, with the powers of escape and invasion; they have their pursuits and their enmities; and, of all creatures of the deep, they have most to fear from each other.

CHAPTER VI.

OF BIVALVED SHELL-FISH, OR SHELLS OF THE OYSTER KIND.

IT may seem whimsical to make a distinction between the animal perfections of turbinated and bivalved shell-fish; or to grant a degree of superiority to the snail above the oyster. Yet this distinction strongly and apparently obtains in Nature; and we shall find the bivalved tribe of animals in every respect inferior to those we have been describing. Inferior in all their sensations; inferior in their powers of motion; but particularly inferior in their system of animal generation. The snail tribe, as we saw, are hermaphrodite, but require the assistance of each other for fecundation; all the bivalve tribe are hermaphrodite in like manner, but they require no assistance from each other towards impregnation; and a single muscle or oyster, if there were no other in the world, would quickly replenish the ocean. As the land snail, from its being best known, took the lead in the former class, so the fresh-water muscle, for the same reason, may take the lead in this. The life and manners of such as belong to the sea will be best displayed in the comparison.

The muscle as is well known, whether belonging to fresh or salt water, consists of two equal shells, joined at the back by a strong, muscular ligament that answers all the purposes of a hinge. By the elastic contraction of these the animal can open its shell at pleasure, about a quarter of an inch from each other. The fish is fixed to either shell by four tendons, by means of which it shuts them close, and keeps its body firm from being crushed by any shock against the walls of its own habitation. It is furnished, like all other animals of this kind, with vital organs, though these are situated in a very extraordinary manner. It has a mouth furnished with two fleshy lips; its intestine begins at the bottom of the mouth, passes through the brain, and makes a number of circumvolutions through the liver; on leaving this organ, it goes on straight into the heart, which it penetrates, and ends in the anus; near which the lungs are placed, and through which it breathes, like those of the snail kind; and in this manner its languid circulation is carried on.*

But the organs of generation are what most deserve to excite our curiosity. These consist in each muscle of two ovaries, which are the female part of its furniture, and of two seminal vessels, resembling what are found in the male.—Each ovary and each seminal vessel, has its own proper canal; by the ovary-canal the eggs descend to the anus; there, also, the seminal canals send their fluids to impregnate them. By this contrivance,

* M. Mery. Anat. de Moules d'Etang.

one single animal suffices for the double purposes of generation; and the eggs are excluded and impregnated by itself alone.

As the muscle is thus furnished with a kind of self-creating power, there are few places where it breeds that it is not found in great abundance. The ovaries usually empty themselves of their eggs in spring, and they are replenished in autumn. For this reason they are found empty in summer and full in winter. They produce in great numbers, as all bivalved shell-fish are found to do. The fecundity of the snail kind is trifling in comparison to the fertility of these. Indeed it may be asserted as a general rule in Nature, that the more helpless and contemptible the animal, the more prolific it is always found. Thus all creatures that are incapable of resisting their destroyers, have nothing but their quick multiplication, for the continuation of their existence.

The multitude of these animals in some places is very great; but, from their defenceless state, the number of their destroyers are in equal proportion. The crab, the cray-fish, and many other animals, are seen to devour them; but the trochus is their most formidable enemy. When their shells are found deserted, if we then observe closely, it is most probable we shall find that the trochus has been at work in piercing them. There is scarce one of them without a hole in it; and this probably was the avenue by which the enemy entered to destroy the inhabitant.

But notwithstanding the number of this creature's animated enemies, it seems still more fearful of the agitations of the element in which it resides; for if dashed against rocks, or thrown far on the beach, it is destroyed without a power of redress. In order to guard against these, which are to this animal the commonest and most fatal accidents, although it has a power of slow motion, which I shall presently describe, yet it endeavours to become stationary, and to attach itself to any fixed object it happens to be near. For this purpose, it is furnished with a very singular capacity of binding itself by a number of threads to whatever object it approaches; and these Reaumur supposed it spun artificially, as spiders their webs which they fasten against a wall. Of this, however, later philosophers have found very great reason to doubt. It is therefore supposed that these threads, which are usually called the beard of the muscle, are the natural growth of the animal's body, and by no means produced at pleasure. Indeed, the extreme length of this beard in some, which far exceeds the length of the body, seems impossible to be manufactured by the thrusting out and drawing in of the tongue, with the glutinous matter of which the French philosopher supposed those threads were formed. It is even found to increase with the growth of the animal; and as the muscle becomes larger and older, the beard becomes longer and its filaments more strong.* Be this as it will, nothing is more certain than that the muscle is found attached by these threads to every fixed object; sometimes, indeed, for want of such an object, these animals are found united to each other; and though thrown into a lake separately, they are taken out in bunches of many together.

To have some fixed resting place where the muscle can continue, and take in its accidental food, seems the state that this animal chiefly desires. Its instrument of motion, by which it contrives to reach the object it wants o bind itself to, is that muscular substance resembling a tongue, which is found long in proportion to the size of the muscle. In some it is two inches long, in others not a third part of these dimensions. This the animal has a power of thrusting out of its shell; and with this it is capable of making a slight furrow in the sand at the bottom. By means of this furrow it can erect itself upon the edge of its shell; and thus continuing to make the furrow in proportion as it goes forward, it reaches out its tongue, that answers the purpose of an arm, and thus carries its shell edge-ways, as in a grove, until it reaches the point intended. There, where it determines to take up its residence, it fixes the ends of its beard which are glutinous, to the rock or the object, whatever it be; and thus, like a ship at anchor, braves all the agitations of the water. Sometimes the animal is attached by a large number of threads; sometimes but by three or four, that seem scarce able to retain it. When the muscle is fixed in this manner, it lives upon the little earthy particles that the water transports to its shell, and perhaps the flesh of the most diminutive animals. However, it does not fail to grow considerably; and some of this kind have been found a foot long. I have seen the beards a foot and a half; and of this substance the natives of Palermo sometimes make gloves and stockings.

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* Mercier du Paty, sur les bouchots à moules. Tom. II. l'Académie de la Rochelle.

These shell-fish are found in lakes, rivers, and in the sea. Those of the lake often grow to a very large size; but they seem a solitary animal, and are found generally separate from each other. Those of rivers are not so large, but yet in greater abundance; but the sea-muscle of all others is perhaps the most plenty. These are often bred artificially in salt-water marshes that are overflowed by the tide; the fishermen throwing them in at the proper seasons; and there being undisturbed by the agitations of the sea, and not preyed upon by their powerful enemies at the bottom, they cast their eggs, which soon become perfect animals, and these are generally found in clusters of several dozens together. It requires a year for the peopling a muscle bed; so that, if the number consists of forty thousand, a tenth part may annually be left for the peopling the bed anew. Muscles are taken from their beds from the month of July to October; and they are sold at a very moderate price.

From this animal the oyster differs very little, except in the thickness of its shell, and its greater imbecility. The oyster, like the muscle, is formed with organs of life and respiration, with intestines which are very voluminous, and liver, lungs, and heart. Like the muscle, it is self-impregnated; and the shell, which the animal soon acquires, serves it for its future habitation. Like the muscle, it opens its shell to receive the influx of water; and like that animal is strongly attached to its shells both above and below.

But it differs in many particulars. In the first place its shells are not equal, the one being cupped, the other flat; upon the cupped shell it is always seen to rest; for if it lay upon the flat side it would then lose all its water. It differs also in the thickness of its shells, which are so strongly lined and defended, that no animal will attempt to pierce them. But though the oyster be secured from the attacks of the small reptiles at the bottom, yet it often serves as an object to which they are attached. Pipe-worms, and other little animals, fix their habitation to the oyster's sides, and in this manner continue to live in security. Among the number of these is a little red worm, that is often found upon the shell; which some, from never seeing oysters copulate, erroneously supposed to be the male by which their spawn was impregnated.

The oyster differs also from the muscle in being utterly unable to change its situation. The muscle, as we have observed, is capable of erecting itself on an edge, and going forward with a slow laborious motion. The oyster is wholly passive, and endeavours by all its powers to rest fixed to one spot at the bottom. It is entirely without that tongue which we saw answering the purposes of an arm in the other animal; but nevertheless is often attached very firmly to any object it happens to approach. Rocks, stones, pieces of timber, or sea-weeds, all seem proper to give it a fixture, and to secure it against the agitation of the waves. Nothing so common in the rivers of the tropical climates as to see oysters growing even amidst the branches of the forest. Many trees which grow along the banks of the stream often bend their branches into the water, and particularly the mangrove, which chiefly delights in a moist situation. To these the oysters hang in clusters, like apples upon the most fertile tree; and in proportion as the weight of the fish sinks the plant into the water, where it still continues growing, the number of oysters increase, and hang upon the branches. Thus, there is nothing that these shell-fish will not stick to; they are often even found to stick to each other. This is effected by means of a glue proper to themselves, which, when it cements, the joining is as hard as the shell, and is as difficultly broken. The joining substance, however, is not always of glue; but the animal grows to the rocks, somewhat like the muscle, by threads; although these are only seen to take root in the shell, and not, as in the muscle, to spring from the body of the fish itself.

Oysters usually cast their spawn in May, which at first appear like drops of candle-grease, and stick to any hard substance they fall upon. These are covered with a shell in two or three days; and in three years the animal is large enough to be brought to market. As they invariably remain in the places where they are laid, and as they grow without any other seeming food than the afflux of sea-water, it is the custom at Colchester, and other parts of the kingdom, where the tide settles in marshes on land, to pick up great quantities of small oysters along the shore, which, when first gathered, seldom exceed the size of a sixpence. These are deposited in beds where the tide comes in, and in two or three years grow to a tolerable size. They are said to be better tasted for being thus sheltered from the agitations of the deep: and a mixture of fresh water entering into these repositories, is said to improve their flavour, and to increase their growth and fatness.

The oysters, however, which are prepared in this manner, are by no means so large as those found sticking to rocks at the bottom of the sea, usually called *rock-oysters*. These are sometimes found as broad as a plate, and are admired by some as excellent food. But what is the size of these compared to the oysters of the East Indies, some of whose shells I have seen two feet over! The oysters found along the coast of Coromandel are capable of furnishing a plentiful meal to eight or ten men; but it seems universally agreed that they are no way comparable to ours for delicacy or flavour.

Thus the muscle and the oyster appear to have but few distinctions, except in their shape and the power of motion in the former. Other bivalved shell-fish, such as the cockle, the scallop, and the razor-shell, have differ ences equally minute. The power of changing place, which some of them effect in a manner quite peculiar to themselves, makes their greatest difference. The scallop is particularly remarkable for its method of moving forward upon land, or swimming upon the surface of the water. When this animal finds itself deserted by the tide, it makes very remarkable efforts to regain the water, moving towards the sea in a most singular manner. It first gapes with its shell as widely as it can, the edges being often an inch asunder; then it shuts them with a jerk, and by this the whole animal rises five or six inches from the ground. It thus tumbles any how forward, and then renews the operation until it has attained its journey's end. When in the water it is capable of supporting itself upon the surface; and there opening and shutting its shells, it tumbles over and over, and makes its way with some celerity.

The Pivot, or Razor-shell, has a very different kind of motion. As the former moves laboriously and slowly forward, so the razor-shell has only a power of sinking point downward. The shells of this animal resemble nothing so much as the haft of a razor; and by this form it is better enabled to dive into the soft sand at the bottom. All the motions of this little animal are confined to sinking or rising a foot downwards or upwards in the sand, for it never leaves the spot where first it was planted. From time to time it is seen to rise about half way out of its hole; but if any way disturbed, it sinks perpendicularly down again. Just over the place where the razor buries itself, there is a small hole like a chimney, through which the animal breathes, or imbibes the sea-water. Upon the desertion of the tide, these holes are easily distinguished by the fishermen who seek for it; and their method of enticing the razor up from the depth of its retreat is by sprinkling a little sea-salt upon the hole. This, melting, no sooner reaches the razor below than it rises instantly straight upwards, and shows about half its length above the surface. This appearance, however, is instantaneous; and if the fisher does not seize the opportunity, the razor buries itself with great ease to its former depth.—There it continues secure; no salt can allure it a second time; but it remains unmolested, unless the fisher will be at the trouble of digging it out sometimes two feet below the surface.

Such are the minute differences in bivalved shell-fish; but in the great outlines of their nature they exactly resemble each other. It is particularly in this class of shell-fish that pearls are found in great abundance; and it is in the internal parts of those shells that are of a shining silvery colour that these gems are usually generated; but the pearl is also found to breed as well in the muscle or the scallop as in the oyster. In fact it is found in all bivalved shells, the insides of which resemble that well known substance called mother-of-pearl.

Whether pearls be a disease or an accident in the animal is scarcely worthy inquiry. The common opinion is, that they are a kind of calculus concretion in the body of the animal, somewhat resembling a stone in the bladder, and are consequently to be considered as a disorder. It is said in confirmation of this opinion, that those coasts upon which pearls are fished, are very unhealthy; and therefore most probably oysters share the general influence of the climate; it is also added that those oysters in which pearls are found are always ill-tasted, which is a sign of their being unsound; and lastly it is asserted that the pearl grows sometimes so big as to keep the shells of the animal from shutting, and thus it dies by being exposed. It is easy to see the weakness of these assertions, which seem neither true nor amusing. To answer them in their own way; If a stone in the bladder be a disorder, a stone in the stomach of an ostrich is a benefit, and so it may be in the shell of an oyster. If the shores where the pearls are fished be unwholesome to man, that, instead of being disadvantageous, is so much the more lucky for the oyster. If the pearl oysters are the worst tasted, so are kites and ravens among birds; and yet we know that they are healthy and long-lived animals: if the oyster had ever its shell kept asunder by the pearl within it, that would be a disease indeed: but this, in reality, never happens; for the oyster that breeds a large pearl always breeds a large shell, and the shell itself indents to receive its impression. The pearl upon the whole seems bred from no disorder in the animal, but accidentally produced by the same matter that goes to form the shell. The substance, which is soft at first, quickly hardens; and thus, by successive coats, layer over layer, the pearl acquires its dimensions. If cut through it will be found to consist of several coats, like an onion; and sometimes a small speck is seen in the middle, upon which the coats were originally formed.

All oysters, and most shell-fish are found to contain pearls; but that which particularly obtains the name of the pearl oyster, has a large strong whitish shell, wrinkled and rough without, and within smooth and of a silver colour. From these the mother-of-pearl is taken, which is nothing more than the internal coats of the shell, resembling the pearl in colour and consistence. This is taken out and shaped into the variety of utensils which are found so beautiful, but the pearl itself is chiefly prized; being found but in few oysters, and generally adhering, sometimes making a print in the body of the shell, sometimes at large within the substance of the fish.

There are a great number of pearl fisheries in America and Asia; but as pearls bear a worse price than formerly, those of America are in a great measure discontinued. The most famous of all the Asiatic fisheries is in the Persian Gulf, near the Isle of Bahren. There is another between the coast of Madura and the Island of Ceylon; and there was a third on the coasts of Japan: but as these noble islanders have a contempt for jewels, and an abhorrence for such Europeans as come in pursuit of them, that fishery, which is thought to be the most valuable of all others, is discontinued. The diving business is now carried on only in those countries where the wretchedness of one part of mankind goes to support the magnificence of the other.

The chief fishery, as was said, is carried on in the Persian Gulf, and the most valuable pearls are brought from thence. The value of these jewels increases not only in proportion to their size, but also their figure and colour; for some pearls are white, others are yellowish, others of a lead colour; and some affirm they have been found as black as jet. What it is that gives these different tinctures to pearls is not known; Taverner ascribes it to lying two or three weeks upon shore after the oyster is taken; Reaumur thinks it proceeds from the colour of that part of the fish's body upon which the pearl lies. It is most probable that this colour proceeds, like the spots frequently found on the internal surface of the shell itself, from some accident while the pearl is growing.

The best coloured pearls, and the roundest, are brought from the East; those of America are neither so white nor so exactly oval. All pearls however, in time become yellow; they may be considered as an animal substance converted into a stony hardness, and like ivory taking a tincture from the air. They have been even found to decay when in damp or vaulted places, and to moulder into a substance scarce harder than chalk. When the daughters of Stilicon, who were both betrothed, one after the other, to the emperor Honorius, were buried, much of their finery was also deposited with them in the same tomb. In this manner they remained buried for eleven hundred years, till the foundations of the church of St. Peter were laying. Their tomb was then discovered, and all their finery was found in tolerable preservation except their pearls, which were converted by time and damps into a chalky powder.

The wretched people that are destined to fish for pearls, are either Negroes or some of the poorest of the natives of Persia. The inhabitants of this country are divided into tyrants and slaves. The divers are not only subject to the dangers of the deep, to tempest, to suffocation at the bottom, to being devoured by sharks, but from their profession universally labour under a spitting of blood, occasioned by the pressure of air upon their lungs in going down to the bottom. The most robust and healthy young men are chosen for this employment, but they seldom survive it above five or six years. Their fibres become rigid; their eye-balls turn red; and they usually die consumptive.

It is amazing how very long they are seen to continue at the bottom. Some, as we are assured, have been known to continue three quarters of an hour under water without breathing; and to one unused to diving, ten minutes would suffocate the strongest. Whether from some effort the blood bursts the old passage which it had in the fœtus, and circulates without going through the lungs, it is not easy to tell; but certain it is that some bodies have been dissected with this canal of communication open, and these extraordinary divers may be internally formed in that manner.

Be this as it may, no way of life seems so laborious, so dangerous, or so painful. They fish for pearls, or rather the oysters that contain them, in boats twenty-eight feet long; and of these there are sometimes three or four hundred at a time, with each seven or eight stones, which serve for anchors. There are from five to eight divers belonging to each, that dive one after another. They are quite naked, except that they have a net hanging down from the neck to put their oysters in, and gloves on their hands to defend them while they pick up the oysters from the holes in the rocks: for in this manner alone can they be gathered. Every diver is sunk by means of a stone, weighing fifty pounds, tied to the rope by which he descends. He places his foot in a kind of stirrup, and laying hold of the rope with his left hand, with his right he stops his nose to keep in his breath, as upon going down he takes in a very long inspiration. They are no sooner come to the bottom, but they give the signal to those who are in the boat to draw up the stone; which done, they go to work, filling there net as fast as they can; and then giving another signal, the boats above pull up the net loaded with oysters, and shortly after the diver himself to take a new inspiration. They dive to the depth of fifteen fathoms, and seldom go deeper. They generally go every morning by break of day to this fatiguing employment, taking the land wind to waft them out to sea. and returning with the sea-breeze at night. The owners of the boats usually hire the divers, and the rest of the boat's crew, as we do our labourers, at so much a day. All the oysters are brought on shore, where they are laid in a great heap, till the pearl fishery is over, which continues during the months of November and December. When opportunity serves, they then examine every oyster, and it is accidental whether the capture turns out advantageous. Indeed no human being can wish well to a commerce, which thus chains such a number of fellow creatures to the bottom, to pluck up a glittering, mouldering pebble.

CHAPTER VII.

OF MULTIVALVE SHELL-FISH.

Multivalve Shell-Fish may be considered as animals shut up in round boxes. To view their habitations externally, one would be little apt to consider them as the retreats of living creatures; and still less, to suppose that some of them carry their boxes with a tolerable share of swiftness, so as to escape their pursuers. Of these there are principally two kinds; such as move, and such as are stationary: the first are usually known in our cabinets by the name of Sea-eggs; the others are as often admired, from the cavities which they scoop out for their habitation in the hardest marble. The first are called, by Naturalists, Echini, or Urchins: the latter are called Pholades, or File-fish. Of both there are several sorts; but, by describing these two, we shall have a competent idea of all the rest.

To a slight view, the sea-urchin may be compared to the husk of a chesnut; being like it round, and with a number of bony prickles standing out on every side. To exhibit this extraordinary animal in every light—if we could conceive a turnip stuck full of pins on every side, and running upon these pins with some degree of swiftness, we should have some idea of this extraordinary creature. The mouth is placed downwards; the vent is above; the shell is a hollow vase, resembling a scooped apple; and this filled with a soft muscular substance, through which the intestines wind from the bottom to the top. The mouth which is placed undermost, is large and red, furnished with five sharp teeth, which are easily discerned. The jaws are strengthened by five small bones, in the centre of which is a small fleshy tongue; and from this the intestines make a winding of five spires round the internal sides of the shell, ending at top, where the excrements are excluded. But what makes the most extraordinary part of this animal's conformation, are its horns and its spines, that point from every part of the body, like the horns of a snail, and that serve at once as legs to move upon, as arms to feel with, and as instruments of capture and defence. Between these horns it has also spines that are not endued with such a share of motion. The spines and the horns issue from every part of the body; the spines being hard and prickly; the horns being soft, longer than the spines, and never seen except in the water. They are put for ward and withdrawn like the horns of a snail, and are hid at the bases of the spines, serving, as was said before, for procuring food and motion. All this apparatus, however, is only seen when the animal is hunting its prey at the bottom of the water; for a few minutes after it is taken, all the horns are withdrawn into the body, and most of the spines drop off.

It is generally said of the insects, that those which have the greatest number of legs, always move the slowest: but this animal seems to be an exception to the rule; for though furnished with two thousand spines, and twelve hundred horns, all serving for legs, and from their number seeming to impede each others motion, yet it runs with some share of swiftness at the bottom, and it is sometimes no easy matter to overtake it. It is often taken upon the ebb, by following it in shallow water, either in an osier basket, or simply with the hand. Both the spines and the horns assist its motion; and the animal is usually seen running with the mouth downward.

Some kinds of this animal are as good eating as the lobster; and its eggs, which are of a deep red, are considered as a very great delicacy. But of others the taste is but indifferent; and in all places, except the Mediterranean, they are little sought for, except as objects of curiosity.

Very different in motion, though not much different in shape from these, are the Acorn Shell-Fish, the Thumb-footed Shell-Fish, and the Imaginary Barnacle. These are fixed to one spot, and appear to vegetate from a stalk. Indeed, to an inattentive spectator, each actually seems to be a kind of fungus that grows in the deep, destitute of animal life as well as motion. But the inquirer will soon change his opinion, when he comes to observe this mushroom-like figure more minutely. He will then see that the animal residing within the shell has not only life, but some degree of voraciousness; that it has a cover, by which it opens and shuts its shell at pleasure; that it has twelve long crooked arms, furnished with hair, which it thrusts forth for its prey; and eight smaller, which are generally kept in the shell. These are seen adhering to every substance that is to be met with in the ocean; rocks, roots of trees, ships' bottoms, whales, lobsters, and even crabs, like bunches of grapes, clung to each other. It is amusing enough to behold their operations.* They for some time remain motionless within their shell; but when the sea is calm, they are seen opening the lid, and peeping about them. They then thrust out their long neck, look round them for some time, and then abruptly retreat back into their box, shut their lid, and lurk in darkness and security. Some people eat them; but they are in no great repute at the tables of the luxurious, where their deformed figure would be no objection to their being introduced.

Of all animals of the shelly tribe, the Pholades are the most wonderful From their great powers of penetration, compared with their apparent imbecility, they justly excite the astonishment of the curious observer. These animals are found in different places; sometimes clothed in their proper shell, at the bottom of the water; sometimes concealed in lumps of marly earth; and sometimes lodged, shell and all, in the body of the hardest marble. In their proper shell they assume different figures; but, in general, they somewhat resemble a muscle, except that their shell is found actually composed of five or more pieces, the smaller valves serving to close the opening left by the irregular meeting of two principal shells. But their penetration into rocks and their residence there, makes up the most wonderful part of their history.

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* Anderson's History of Greenland.

This animal, when divested of its shell, resembles a roundish soft pudding, with no instrument that seems in the least fitted for boring into stones, or even penetrating the softest substances. It is furnished with two teeth indeed; but these are placed in such a situation as to be incapable of touching the hollow surface of its stony dwelling: it has also two covers to its shell, that open and shut at either end; but these are totally unserviceable to it as a miner. The instrument with which it performs all its operations, and buries itself in the hardest rocks, is only a broad fleshy substance, somewhat resembling a tongue, that is seen issuing from the bottom of its shell. With this soft, yielding instrument, it perforates the most solid marbles; and having, while yet little and young, made its way, by a very narrow entrance, into the substance of the stone, it then begins to grow bigger, and thus to enlarge its apartment.

The seeming unfitness, however, of this animal for penetrating into rocks, and there forming an habitation, has induced many philosophers to suppose that they entered the rock while it was yet in a soft state, and from the petrifying quality of the water, that the whole rock afterwards hardened round them by degrees. Thus any penetrating quality, it was thought, was unjustly ascribed to them, as they only bored into a soft substance, that was hardened by time.—This opinion, however, has been confuted, in a satisfactory manner, by Dr. Bohadsch, who observed, that many of the pillars of the temple of Serapis at Puteoli were penetrated by these animals. From thence he very justly concludes, that the pholades must have pierced into them since they were erected; for no workman would have laboured a pillar into form, if it had been honey-combed by worms in the quarry. In short, there can be no doubt but that the pillars were perfectly sound when erected; and that the pholades have attacked them, during that time in which they continued buried under water, by means of the earthquake that swallowed up the city.*

From hence it appears, that, in all Nature, there is not a greater instance of perseverance and patience than what this animal is seen to exhibit. Furnished with the bluntest and softest auger, by slow, successive applications, it effects what other animals are incapable of performing by force; penetrating the hardest bodies only with its tongue. When, while yet naked and very small, it has effected an entrance, and has buried its body in the stone, it there continues for life at its ease; the sea-water that enters at the little aperture supplying it with luxurious plenty. When the animal has taken too great a quantity of water, it is seen to spurt it out of its hole with some violence. Upon this seemingly thin diet, it quickly grows larger, and soon finds itself under a necessity of enlarging its habitation and its shell. The motion of the pholas is slow beyond conception; its progress keeps pace with the growth of its body; and, in proportion as it becomes larger, it makes its way farther into the rock. When it has got a certain way in, it then turns from its former direction, and hollows downward; till, at last, when its habitation is completed, the whole apartment resembles the hole of a tobacco pipe; the hole in the shank being that by which the animal entered.

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* Bohadsch Animalibus Marinis, p. 153.

Thus immured, the pholas lives in darkness, indolence, and plenty; it never removes from the narrow mansion into which it has penetrated; and and seems perfectly content with being inclosed in its own sepulchre. The influx of the sea-water, that enters by its little gallery, satisfies all its wants; and without any other food, it is found to grow from seven to eight inches long, and thick in proportion.

But they are not supplied only with their rocky habitation; they have also a shell to protect them: this shell grows upon them in the body of the rock, and seems a very unnecessary addition to their defence, which they have procured themselves by art. These shells take different forms, and are often composed of a different number of valves; sometimes six; sometimes but three: sometimes it resembles a tube with holes at either end, one for the mouth, and the other for voiding the excrements.

Yet the pholas thus shut up, is not so solitary an animal as it would at first appear; for though it is immured in its hole without egress, though it is impossible for the animal, grown to a 'great size, to get out by the way it made in, yet many of this kind often meet in the heart of the rock, and like miners in a siege, who sometimes cross each other's galleries, they frequently break in upon each other's retreats. Whether their thus meeting be the work of accident or of choice, few can take upon them to determine; certain it is, they are most commonly found in numbers in the same rock; and sometimes above twenty are discovered within a few inches of each other.

As to the rest, this animal is found in greatest numbers at Ancona, in Italy; it is found along the shores of Normandy and Poitou, in France: it is found also upon some of the coasts of Scotland: and in general, is considered as a very great delicacy at the tables of the luxurious.

PART V.

OF FROGS, LIZARDS, AND SERPENTS.

BOOK I.

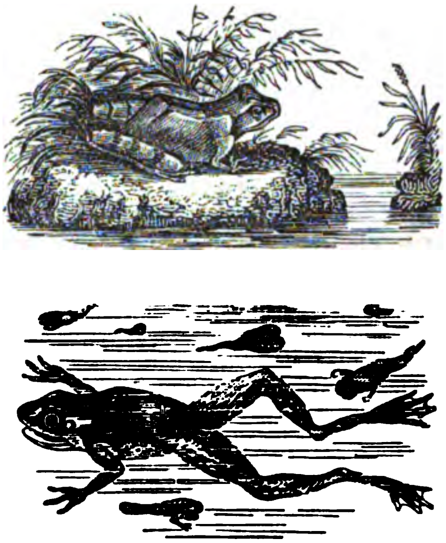
OF FROGS AND TOADS.

CHAPTER I.

OF FROGS AND TOADS IN GENERAL.

IF we emerge from the deep, the first and most obvious of amphibious animals that occur on land are frogs and toads. These, wherever they reside, seem equally adapted for living upon land and in the water, having their hearts formed in such a manner as to dispense with the assistance of the lungs in carrying on the circulation. The frog and the toad therefore can live several days under water, without any danger of suffocation; they want but little air at the bottom; and, what is wanting is supplied by lungs, like bladders, which are generally distended with wind, and answer all the purposes of a reservoir from whence to breathe.

To describe the form of animals so well known would be superfluous; to mark those differences that distinguish them from each other may be useful. The frog moves by leaping; the toad crawls along the ground: the frog is in general less than the toad; its colour is brighter, and with a more polished surface: the toad is brown, rough, and dusky. The frog is light and active, and its belly comparatively small; the toad is slow, swollen, and incapable of escaping. The frog, when taken, contracts itself so as to have a lump on its back; the toad's back is straight and even. Their internal parts are nearly the same, except that the lungs of the toad are more compact than those of the frog; they have air-bladders, and of consequence the animal is less fitted for living under water. Such are the differences with respect to figure and conformation; their habitudes and manners exhibit a greater variety, and require a separate description.



Frogs, p. 49.

Sirens.

To face p. 48, vol. iv

CHAPTER II.

OF THE FROG AND ITS VARIETIES.

THE external figure of the Frog is too well known to need a description. Its power of taking large leaps is remarkably great, compared to the bulk of its body. It is the best swimmer of all four-footed animals; and Nature hath finely adapted its parts for those ends, the arms being light and active, the legs and thighs long, and furnished with very strong muscles.

If we examine this animal internally, we shall find that it has a very little brain for its size; a very wide swallow; a stomach seemingly small, but capable of great distension. The heart in the frog, as in all other animals that are truly amphibious, has but one ventricle; so that the blood can circulate without the assistance of the lungs, while it keeps under water. The lungs resemble a number of small bladders joined together, like the cells of a honey comb: they are connected to the back by muscles, and can be distended or exhausted at the animal's pleasure. The male has two testiculi lying near the kidneys: and the females have two ovaries, lying near the same place: but neither male nor female have any of the external instruments of generation; the anus serving for that purpose in both. Such are the most striking peculiarities in the anatomy of a frog; and in these it agrees with the toad, the lizard and the serpent. They are all formed internally pretty much in the same manner, with spongy lungs, a simple heart, and are destitute of the external instruments that serve to continue the kind.

Of all those who have given histories of the frog, Mr. Ræsel, of Nuremberg, seems the most accurate and entertaining. His plates of this animal are well known; his assiduity and skilfulness in observing its manners are still more deserving our esteem. Instead, therefore, of following any other, I will take him for my guide; and though it be out of my power to amuse the reader with his beautiful designs, yet there will be some merit in transcribing his history.

The Common Brown Frog begins to couple early in the season, and as soon as the ice is thawed from the stagnating waters. In some places the cold protracts their genial appetite till April; but it generally begins about the middle of March. The male is usually of a greyish brown colour; the female is more inclining to yellow, speckled with brown. When they couple, the colours of both are nearly alike on the back; but as they change their skins almost every eighth day, the old one falling off in the form of mucus, the male grows yellower, and the female more brown. In the males the arms and legs are much stronger than in the females; and, at the time of coupling, they have upon their thumbs, a kind of fleshy excrescence which they fix firmly to the breast of the female. This Linnæus supposed to be the male instrument of generation; but, by closer inspection, it is found only of service in holding the female in a more strict embrace It may be cut off and the impregnation continue unimpaired: it is sometimes found in the opposite sex; and some of the males are found entirely without it: however, when it is cut off, the male cannot hold the female so strongly as before.

The sex couple only once a year; and then continue united sometimes for four days together. At this time they both have their bellies greatly swollen; that of the female being filled with eggs; the male having the skin of the whole body distended with a limpid water, which is ejected in impregnation. As soon as the male has leaped upon the female, he throws his fore legs round her breast, and closes them so firmly that it is impossible with the naked hands to loose them. The male clasps his fingers between each other, in the same manner as people when they are praying; the thumbs press with their thickest sides against the breast of the female; and though she should struggle ever so much, nothing can induce him to let go his hold. The grasp seems involuntary and convulsive; they cannot be easily torn asunder; and they swim, creep, and live united for some days successively, till the female has shed her spawn, which at length she does almost in an instant. But how the impregnation is performed, without any apparent instruments of generation, has long been an object of inquiry; and still continues in great obscurity. To investigate the difficulty as carefully as possible, our German philosopher continued to examine their mutual congress for three years together, and availed himself of all the lights that the knife, or analogy, could furnish.

After having chosen twelve couple of frogs that were thus joined to each other, and having placed each couple in a glass vessel with water, he scarce let them out of his sight day or night, and even sat up two nights together to examine their operations. The first day he observed nothing that deserved remark; but the second they began to be agitated more than before; the males made a noise somewhat resembling the grunting of a hog; the females only kept sinking and rising in the water.

The male of the first couple ejected the humidity with which his body was swollen, by which the water in the glass was made muddy; and he soon after quitted the female.—Our philosopher continued for twelve hours to observe whether the female would cast her spawn; but finding her tardy, he dissected both her and the male: in the latter the spermatic vessels were quite empty, as might naturally have been supposed; but, for the female, her spawn still remained in her body. Upon its being extracted, and put into water, it perished without producing any animal whatever. From hence he justly concluded, that it required that the eggs should be ejected from the body of the female before they could be at all prolific. In another pair the male quitted the female, who did not eject her spawn till sixteen days after; and these, like the former, came to nothing. But it was very different with some of the rest. The females ejected their spawn, while the male still remained in his station, and impregnated the masses at different intervals as they fell from her; and these all brought forth animals in the usual course of generation. From these observations it was easy to infer, that the female was impregnated neither by the mouth, as some philosophers imagined, nor by the excrescence at the thumbs, as was the opinion of Linnæus, but by the inspersion of the male seminal fluid upon the eggs as they proceeded from the body

Toads. p. 54.

Alligator, p. 64.

To face p. 51, vol. iv.

A single female produces from six to eleven hundred eggs at a time; and, in general, she throws them all out together, by a single effort; though sometimes she is an hour in performing this task. While she is thus bringing forth, it may be observed, that the male acts the part of a midwife, and promotes the expulsion of the eggs by working with his thumbs, and compressing the female's body more closely. The eggs which were compressed in the womb, upon being emitted, expand themselves into a round form, and drop to the bottom of the water, while the male swims off, and strikes with his arms as usual, though they had continued so long in a state of violent contraction.

The egg, or little black globe, which produces a tadpole, is surrounded with two different kinds of liquor. That which immediately surrounds the globe is clear and transparent, and contained in its proper membrane; that which surrounds the whole is muddy and mucus. The transparent liquor serves for the nourishment of the tadpole from time to time; and answers the same purpose that the white of the egg does to birds. The tadpoles, when this membrane is broken, are found to adhere with their mouth to part of it; and when they get free, they immediately sink to the bottom of the water, never being able to get to the top after, while they continue in their tadpole form.

But to return—When the spawn is emitted and impregnated by the male, it drops, as was said, to the bottom, and there the white quickly and insensibly increases. The eggs, which during the four first hours suffer no perceptible change, begin then to enlarge and grow lighter; by which means they mount to the surface of the water. At the end of eight hours, the white in which they swim grows thicker, the eggs lose their blackness, and, as they increase in size, somewhat of their spherical form. The twenty-first day the egg is seen to open a little on one side, and the beginning of a tail to peep out, which becomes more and more distinct every day. The thirty-ninth day the little animal begins to have motion; it moves at intervals its tail: and it is perceived that liquor in which it is circumfused, serves it for nourishment. In two days more, some of these little creatures fall to the bottom; while others remain swimming in the fluid around them, while their vivacity and motion is seen to increase. Those which fall to the bottom remain there the whole day; but having lengthened themselves a little, for hitherto they are doubled up, they mount at intervals to the mucus which they had quitted, and are seen to feed upon it with great vi vacity. The next day they acquire their tadpole form. In three days more they are perceived to have two little fringes, that serve as fins, beneath the head; and these in four days after, assume a more perfect form. It is then, also, that they are seen to feed very greedily upon the pond-weed with which they are to be supplied; and, leaving their former food, on this they continue to subsist till they arrive at maturity. When they come to be ninety-two days old, two small feet are seen beginning to bourgeon near the tail: and the head appears to be separate from the body. The next day, the legs are considerably enlarged; four days after they refuse all vegetable food; their mouth appears furnished with teeth; and their hinder-legs are completely formed. In two days more the arms are completely produced• and now the frog is every way perfect, except that it still continues to carry the tail. In this odd situation the animal, resembling at once both a frog and a lizard, is seen frequently rising to the surface, not to take food but to breathe. In this state it continues for about six or eight hours, and then, the tail dropping off by degrees, the animal appears in its most perfect form.

Thus the frog, in less than a day, having changed its figure, is seen to change its appetites also. So extraordinary is this transformation, that the food it fed upon so greedily but a few days before, is now utterly rejected, it would even starve if supplied with no other. As soon as the animal acquires its perfect state, from having fed upon vegetables, it becomes carnivorous, and lives entirely upon worms and insects. But as the water cannot supply these, it is obliged to quit its native element, and seek for food upon land, where it lives by hunting worms, and taking insects by surprise. At first, being feeble and unable to bear the warmth of the sun, it hides among bushes and under stones; but when a shower comes to refresh the earth, then the whole multitude are seen to quit their retreats, in order to enjoy the grateful humidity. Upon many occasions the ground is seen perfectly blackened with their numbers; some hunting for prey, and some seeking secure lurking places. From the myriads that offer on such occasions, some have been induced to think that these animals were generated in the clouds, and thus showered down on the earth. But had they, like Derham, traced them to the next pool, they would have found out a better solution for the difficulty.

The frog lives for the most part out of the water; but when the cold nights begin to set in, it returns to its native element always choosing stagnant waters where it can lie without danger concealed at the bottom. In this manner it continues torpid, or with but very little motion, all the winter: like the rest of the dormant race, it requires no food; and the circulation is slowly carried on without any assistance from the air.

It is at the approach of spring that all these animals are roused from a state of slumber to a state of enjoyment. A short time after they rise from the bottom they begin to pair, while those that are as yet too young come upon land before the rest. For this reason, while the old ones continue concealed in the beginning of spring, the small ones are more frequently seen; the former remaining in the lake to propagate, while the latter are not yet arrived at a state of maturity.

The difference of sexes, which was mentioned above, is not perceivable in those animals, until they have arrived at their fourth year; nor do they begin to propagate, till they have completed that period. By comparing their slow growth with their other habitudes, it would appear that they live about twelve years; but having so many enemies, both by land and water, it is probable that few of them arrive at the end of their term.

Frogs live upon insects of all kinds; but they never eat any unless they have motion. They continue fixed and immoveable till their prey appears; and just when it comes sufficiently near, they jump forward with great agility, dart out their tongues, and seize it with certainty. The tongue, in this animal as in the toad, lizard, and serpent kinds, is extremely long, and formed in such a manner, that it swallows the point down its throat; so that a length of tongue is thus drawn out, like a sword from its scabbard, to assail its prey. This tongue is furnished with a glutinous substance; and whatever insect it touches, infallibly adheres, and is thus held fast till it is drawn into the mouth.

As the frog is thus supplied with the power of catching its prey, it is also very vivacious, and able to bear hunger for a very long time. I have known one of them continue a month in summer without any other food than the turf on which it was placed in a glass vessel. We are told of a German surgeon, that kept one eight years in a glass vessel, covered with a net. Its food was at all times but sparing; in summer he gave it fresh grass, which it said to have fed upon; and, in the winter, hay, a little moistened: he likewise, now and then, put flies into the glass, which it would follow with an open mouth, and was very expert in catching them. In winter, when the flies were difficult to be found, it usually fell away, and grew very lean; but in the summer, when they were plenty, it soon grew fat again. It was kept in a warm room, and was always lively and ready to take its prey; however, in the eighth winter, when there were no flies to be found, it fell away and died. It is not certain how long it might have lived, had it been supplied with proper nourishment; but we are certain, that a very little food is capable of sufficing its necessities.

Nor is the frog less tenacious of life. It will live and jump about several hours after its head has been cut off. It will continue active though all its bowels are taken out; and it can live some days, though entirely stripped of its skin. This cruel trick, which is chiefly practised among schoolboys, of skinning frogs, an operation which is done in an instant, seems for some hours no way to abate their vigour. I am assured that some of them get a new skin, and recover after this painful experiment.

The croaking of frogs is well known; and, from thence, in some countries, they are distinguished by the ludicrous title of Dutch Nightingales. Indeed, the aquatic frogs of Holland are loud beyond what one would imagine. We could hardly conceive that an animal not bigger than one's fist, should be able to send forth a note that is heard at three miles distance; yet such is actually the case.* The large water-frogs have a note as loud as the bellowing of a bull; and, for this purpose, puff up the cheeks to a surprising magnitude. Of all frogs, however, the male only croaks; the female is silent, and the voice in the other seems to be the call to courtship. It is certain, that at these times when they couple, the loudness of their croaking is in some places very troublesome; for then the whole lake seems vocal; and a thousand dissonant notes perfectly stun the neighbourhood. At other times, also, before wet weather, their voices are in full exertion; they are then heard with unceasing assiduity, sending forth their call, and welcoming the approaches of their favourite moisture. No weather-glass was ever so true as a frog in foretelling an approaching change; and, in fact, the German surgeon, mentioned above, kept his frog for that purpose. It was always heard to croak at the approach of wet weather; but was as mute as a fish when it threatened a continuance of fair. This may probably serve to explain an opinion which some entertain, that there is a month in the year, called *Paddock Moon*, in which the frogs never croak: the whole seems to be no more than that, in the hot season, when the moisture is dried away, and consequently when these animals neither enjoy the quantity of health or food that at other times they are supplied with, they show by their silence, how much they are displeased with the weather. All very dry weather is hurtful to their health, and prevents them from getting their prey. They subsist chiefly upon worms and snails; and as drought prevents these from appearing, the frog is thus stinted in its provisions, and also wants that grateful humidity which moistens its skin, and renders it alert and active.

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* Rœsel, ibid.

As frogs adhere closely to the backs of their own species, so it has been found, by repeated experience, they will also adhere to the backs of fishes Few that have ponds, but know that these animals will stick to the backs of carp, and stick their fingers in the corner of each eye. In this manner they are often caught together; the carp blinded and wasted away. Whether this proceeds from the desires of the frog, disappointed of its proper mate, or whether it be a natural enmity between frogs and fishes, I will not take upon me to say. A story told us by Walton, might be apt to incline us to the latter opinion.

"As Dubravius, a bishop of Bohemia, was walking with a friend by a large pond in that country, they saw a frog, when a pike lay very sleepily and quiet by the shore side, leap upon his head, and the frog having expressed malice or anger by his swollen cheeks and staring eyes, did stretch out his legs, and embraced the pike's head, and presently reached them to his eyes, tearing with them and his teeth those tender parts; the pike irritated with anguish, moves up and down the water, and rubs himself against weeds, and whatever he thought might quit him of his enemy, but all in vain, for the frog did continue to ride triumphantly, and to bite and torment the pike till his strength failed, and then the frog sunk with the pike to the bottom of the water: then presently the frog appeared again at the top and croaked, and seemed to rejoice like a conqueror; after which he presently retired to his secret hole. The bishop that had beheld the battle, called his fisherman to fetch his nets, and by all means to get the pike, that they might declare what had happened. The pike was drawn forth, and both his eyes eaten out; at which when they began to wonder, the fisherman wished them to forbear, and assured them he was certain that pikes were often so served."

CHAPTER III.

OF THE TOAD AND ITS VARIETIES.

IF we regard the figure of the toad, there seems nothing in it that should disgust more than that of the frog. Its form and proportions are nearly the same; and it chiefly differs in colour, which is blacker; and its slow and heavy motion, which exhibits nothing of the agility of the frog: yet such is the force of habit, begun in early prejudice, that those who consider the one as a harmless, playful animal, turn from the other with horror and disgust The frog is considered as an useful assistant, in ridding our grounds of vermin; the toad, as a secret enemy, that only wants an opportunity to infect us with its venom.

The imagination, in this manner biassed by its terrors, paints out the toad in the most hideous colouring, and clothes it in more than natural deformity. Its body is broad; its back flat; covered with a dusky, pimpled hide; the belly is large and swagging; the pace laboured and crawling; its retreat gloomy and filthy; and its whole appearance calculated to excite disgust and horror: yet, upon my first seeing a toad, none of all these deformities in the least affected me with sensations of loathing: born, as I was in a country where there are no toads, I had prepared my imagination for some dreadful object; but there seemed nothing to me more alarming in the sight, than in that of a common frog; and, indeed, for some time, I mistook and handled one for the other. When first informed of my mistake, I very well remember my sensations: I wondered how I had escaped with safety, after handling and dissecting a toad, which I had mistaken for a frog. I then began to lay in a fund of horror against the whole tribe, which, though convinced they are harmless, I shall never get rid of. My first imaginations were too strong not only for my reason, but for the conviction of my senses.

As the toad bears a general resemblance of figure to the frog, so also it resembles that animal in its nature and appetites. Like the frog the toad is amphibious; like that animal, it lives upon worms and insects, which it seizes by darting out its length of tongue; and in the same manner also it crawls about in moist weather. The male and female couple as in all the frog kind; their time of propagation being very early in the spring. Sometimes the females are seen upon land oppressed by the males; but more frequently they are coupled in the water. They continue together some hours, and adhere so fast as tear the very skin from the parts they stick to. In all this they entirely resemble the frog; but the assistance which the male lends the female, in bringing forth, is a peculiarity in this species that must not be past over in silence. "In the evening of a summer's day, a French gentleman, being in the king's gardens at Paris, perceived two toads coupled together, and he stopped to examine them. Two facts equally new surprised him: the first was the extreme difficulty the female had in laying her eggs; the second was the assistance lent her by the male for this purpose. The eggs of the female lie in her body, like beads on a string; and after the first, by great effort, was excluded, the male caught it with his hinder paws, and kept working it till he had thus extracted the whole chain. In this manner the animal performed, in some measure, the functions of a midwife; impregnating, at the same time, every egg as it issued from the body."

It is probable, however, that this difficulty in bringing forth, obtains only upon land; and that the toad, which produces its spawn in the water, performs it with as much ease as a frog. They propagate in England exactly in the manner of frogs; and the female, instead of retiring to dry holes, goes to the bottom of ponds, and there lies torpid all the winter, preparing to propagate in the beginning of spring. On these occasions, the number of males is found greatly to surpass that of the other sex, there being above thirty to one; and twelve or fourteen are often seen clinging to the same female.

When, like the frog, they have undergone all the variations of their tadpole state, they forsake the water; and are often seen, in a moist summer's evening, crawling up, by myriads, from fenny places, into dryer situations

There, having found out a retreat, or having dug themselves one with their mouth and hands, they lead a patient, solitary life, seldom venturing out, except when the moisture of a summer's evening invites them abroad. At that time the grass is filled with snails, and the pathways covered with worms, which make their principal food. Insects also of every kind they are fond of; and we have the authority of Linnæus for it, that they sometimes continue immoveable, with their mouth open, at the bottom of shrubs, where the butterflies, in some measure fascinated, are seen to fly down their throats.[*]

In a letter from Mr. Arscott, are some curious particulars relating to this animal, which throws great light upon its history. "Concerning the toad," says he, "that lived so many years with us, and was so great a favourite, the greatest curiosity was its becoming so remarkably tame: it had frequented some steps before our hall-door some years before my acquaintance commenced with it, and had been admired by my father for its size, (being the largest I ever met with) who constantly paid it a visit every evening. I knew it myself above thirty years; and by constantly feeding it, brought it to be so tame, that it always came to the candle and looked up, as if expecting to be taken up and brought upon the table, where I always fed it with insects of all sorts. It was fondest of flesh maggots, which I kept in bran; it would follow them, and when within a proper distance, would fix his eyes and remain motionless for near a quarter of a minute, as if preparing for the stroke, which was an instantaneous throwing its tongue at a great distance upon the insect, which stuck to the tip by a glutinous matter. The motion is quicker than the eye can follow. I cannot say how long my father had been acquainted with the toad, before I knew it; but when I was first acquainted with it, he used to mention it as the old toad I have known so many years: I can answer for thirty-six years. This old toad made its appearance as soon as the warm weather came; and I always concluded it retired to some dry bank, to repose till spring. When we new-layed the steps, I had two holes made in the third step, on each with a hollow of more than a yard long for it; in which I imagine it slept, as it came from thence at its first appearance. It was seldom provoked. Neither that toad, nor the multitudes I have seen tormented with great cruelty, ever showed the least desire of revenge, by spitting or emitting any juice from their pimples. Sometimes upon taking it up, it would let out a great quantity of clear water, which, as I have often seen it do the same upon the steps when quite quiet, was certainly its urine, and no more than a natural evacuation. Spiders, millipedes, and flesh maggots, seem to be this animal's favourite food. I imagine if a bee was to be put before a toad, it would certainly eat it to its cost;[†] but as bees are seldom stirring at the same time that toads are, they rarely come in their way; as they do not appear after sun-rising, or before sun-set. In the heat of the day they will come to the mouth of their hole, I believe for air. I once, from my parlour window, observed a large toad I had in the bank of a bowling-green, about twelve at noon in a very hot day, very busy and active upon the grass. So uncommon an appearance made me go out to see what it was; when I found an innumerable swarm of winged ants had dropped round his hole; which temptation was as irresistible as a turtle would be to a luxurious alderman. In respect to its end, had it not been for a tame raven, I make no doubt but it would have been now living. This bird, one day seeing it at the mouth of its hole, pulled it out, and although I rescued it, pulled out one eye, and hurt it so, that notwithstanding its living a twelvemonth, it never enjoyed itself, and had a difficulty of taking its food, missing the mark for want of its eye. Before that accident, it had all the appearance of perfect health."

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[*] Amœnit. vol. vi. p. 201.

[†] Ræsel tried a frog; it swallowed the bee alive: its stomach was stung, and the animal vomited it up again.

To this account of the toad's inoffensive qualities, I will add another from Valisnieri, to show that, even taken internally, the toad is no way dangerous. "In the year 1692, some German soldiers, who had taken possession of the castle of Arceti, finding that the peasants of the country often amused themselves in catching frogs, and dressing them for the table; resolved to provide themselves with a like entertainment, and made preparations for frog fishing, in the same manner. It may easily be supposed that the Italians and their German guests were not very fond of each other; and indeed it is natural to think that the soldiers gave the poor people of the country many good reasons for discontent. They were not a little pleased, therefore, when they saw them go to a ditch where toads instead of frogs were found in abundance. The Germans, no way distinguishing, in their sport, caught them in great numbers; while the peasants kept looking on, silently flattering themselves with the hopes of speedy revenge. After being brought home, the toads were dressed up after the Italian fashion: the peasants quite happy at seeing their tyrants devour them with so good an appetite, and expecting every moment to see them drop down dead: but what was their surprise to find, that the Germans continued as well as ever, and only complained of a slight excoriation of the lips, which probably arose from some other cause than that of the repast."

I will add another story from Solenander; who tells us that a tradesman of Rome and his wife had long lived together with mutual discontent; the man was dropsical, and the woman amorous: this ill-matched society promised soon, by the very infirm state of the man, to have an end; but the woman was unwilling to wait the progress of the disorder; and therefore concluded that, to get rid of her husband, nothing was left her but poison. For this purpose, she chose out a dose that she supposed would be the most effectual; and having calcined some toads, mixed their powder with his drink. The man, after taking a hearty dose, found no considerable inconvenience, except that it greatly promoted urine. His wife who considered this as a beginning symptom of the venom, resolved not to stint the next dose, but gave it in greater quantities than before. This also increased the former symptom; and, in a few days, the woman had the mortification to see her detested husband restored to perfect health; and remained in utter despair of her being a widow.

From all this it will appear with what injustice this animal has hitherto been treated. It has undergone every reproach; and mankind have been taught to consider as an enemy, a creature that destroys that insect tribe which are their real invaders. We are to treat, therefore, as fables, those accounts that represent the toad as possessed of poison to kill at a distance; of its ejecting its venom, which burns wherever it touches; of its infecting those vegetables near which it resides; of its excessive fondness for sage, which it renders poisonous by its approach: these, and a hundred others of the same kind, probably took rise from an antipathy which some have to all animals of the kind. It is an harmless, defenceless creature, torpid and unvenomous, and seeking the darkest retreats, not from the malignity of its nature, but the multitude of its enemies.

Like all the frog kind, the toad is torpid in winter. It chooses then for a retreat either the hollow root of a tree, the cleft of a rock, or sometimes the bottom of a pond, where it is found in a state of seeming insensibility. As it is very long-lived, it is very difficult to be killed; its skin is tough, and cannot be easily pierced; and, though covered with wounds, the animal continues to show signs of life, and every part appears in motion. But what shall we say to its living for centuries lodged in the bosom of a rock, or cased within the body of an oak tree, without the smallest access on any side either for nourishment or air, and yet taken out alive and perfect! Stories of this kind it would be as rash to contradict, as difficult to believe; we have the highest authorities bearing witness to their truth, and yet the whole analogy of Nature seems to arraign them of falsehood. Bacon asserts, that toads are found in this manner; Doctor Plot asserts the same: there is to this day a marble chimney-piece at Chatsworth with the print of the toad upon it, and a tradition of the manner in which it was found. In the Memoirs of the Academy of Sciences, there is an account of a toad found alive and healthy in the heart of a very thick elm, without the smallest entrance or egress.* In the year 1731, there was another found near Nantes in the heart of an old oak, without the smallest issue to its cell; and the discoverer was of opinion, from the size of the tree, that the animal could not be confined there less than eighty or a hundred years, without sustenance or without air. To all these we can only oppose the strangeness of the facts; the necessity this animal appears under of receiving air; and its dying like all other animals in the air-pump, when deprived of this all-sustaining fluid. But whether these be objections to weigh against such respectable and disinterested authority, I will not pretend to determine; certain it is, that if kept in a damp place, the toad will live for several months without any food whatsoever.

To this extraordinary account, which is doubtful, I will add another not less so; which is that of toads sucking cancerous breasts, and thus extracting the venom and performing a cure. The first account we have of this, is in a letter to the Bishop of Carlisle from Doctor Pitfield, who was the first person of consequence that attended the experiment. His letter is as follows:

"Your lordship must have taken notice of a paragraph in the papers with regard to the application of toads to a cancered breast. A patient of mine has sent to the neighbourhood of Hungerford, and brought down the very woman on whom the cure was done. I have, with all the attention I am capable of, attended the operation for eighteen or twenty days, and am surprised at the phenomenon. I am in no expectation of any great service from the application; the age, constitution, and thoroughly cancerous condition of the person, being unconquerable barriers to it. How an ailment of that kind, absolutely local, in an otherwise sound habit and of a likely age, might be relieved, I cannot say. But as to the operation, thus much I can assert, it is neither painful nor nauseous. The animal is put into a linen bag all but its head, and that is held to the part. It has generally instantly laid hold of the foulest part of the sore, and sucked with greediness until it dropped off dead. It has frequently happened that the creature has swollen immediately, and from its agonies appeared to be in great pain. I have weighed them for several days together, before and after the application, and found their increase of weight, in their different degrees, from a drachm to near an ounce. They frequently sweat exceedingly, and turn quite pale; sometimes they disgorge, recover and become lively again: I think the whole scene is surprising, and a very remarkable piece of natural history. From the constant inoffensiveness which I have observed in them, I almost question the truth of their poisonous spitting. Many people here expect no great good from the application of toads to cancers; and where the disorder is not absolutely local, none is to be expected. When it is seated in any part not to be well come at for extirpation, I think it is hardly to be imagined, but that the having it sucked clean as often as you please, must give great relief. Every body knows that dogs licking of sores cures them, which is I suppose chiefly by keeping them clean. If there is any credit to be given to history, poisons have been sucked out. *Pallentia vulnera lambit ore venena trahens*, are the words of Lucan on the occasion. If the people to whom these words are applied did their cure by immediately following the injection of the poison, the local confinement of another poison brings the case to a great degree of similarity. I hope I have not tired your Lordship with my long tale; as it is a true one, and in my apprehension a curious piece of natural history, I could not forbear communicating it to you. I own I thought the story in the papers to be an invention; and when I considered the instinctive principle in all animals of self-preservation, I was confirmed in my disbelief: but what I have related I saw; and all theory must yield to fact. It is only the Rubeth, the land toad, which has the property of sucking: I cannot find any the least mention of the property in any one of the old naturalists. My patient can bear to have but one applied in twenty-four hours. The woman who was cured had them on day and night without intermission for five weeks. Their time of hanging at the breast has been from one to six hours."

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* Vide the year 1719

Other remarks made upon their method of performing this extraordinary operation are as follow: "Some toads die very soon after they have sucked; others live about a quarter of an hour, and some much longer. For example, one that was applied about seven o'clock sucked till ten, and died as soon as it was taken from the breast; another that immediately succeeded continued till three o'clock, but dropped dead from the wound: each swelled exceedingly, and of a pale colour. They do not seem to suck greedily, and often turn their heads away; but during the time of their sucking, they were heard to smack their lips like a young child."*

From this circumstantial account of the progress of this extraordinary application, one could hardly suppose that any doubt could remain of the ingenious observer's accuracy; and yet, from information which I have received from authority still more respectable, there is much reason as yet to suspend our assent. A lady, who was under the care of the present president of the college of physicians, was induced by her friends to try the experiment; and as he saw the case was desperate, and that it would quiet her mind as well as theirs, he permitted the trial. During the whole continuance of their application, she could never thoroughly perceive that they sucked her; but that did not prevent their swelling and dying, as in the former instances. Once indeed, she said, she thought that one of them, seemed to suck; but the physician and those who attended, could not perceive any appearance of it. Thus, after all, it is a doubt whether these animals die by the internal or the external application of the cancerous poison.

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* British Zoology, vol iii. p. 338

Of this animal there are several varieties; such as the Water and the Land-Toad, which probably differ only in the ground-colour of their skin. In the first, it is more inclining to ash-colour, with brown spots; in the other the colour is brown, approaching to black. The water toad is not so large as the other; but both equally breed in that element. The size of the toad with us is generally from two to four inches long; but in the fenny countries of Europe, I have seen them much larger, and not less than a common crab, when brought to table. But this is nothing to what they are found in some of the tropical climates, where travellers often, for the first time, mistake a toad for a tortoise. Their usual size is from six to seven inches; but there are some still larger, and as broad as a plate. Of these some are beautifully streaked and coloured; some studded over, as with pearls; others bristled with horns or spines; some have the head distinct from the body, while others have it so sunk in, that the animal appears without a head. All these are found in the tropical climates, in great abundance; and particularly after a shower of rain. It is then that the streets seem entirely paved with them; they then crawl from their retreats, and go into all places to enjoy their favourite moisture. With us the opinion of its raining toads and frogs has long been justly exploded; but it still is entertained in the tropical countries; and that not only by the savage natives, but the more refined settlers, who are apt enough to add the prejudices of other nations to their own.

It would be a tedious, as well as useless task, to enter into all the minute discriminations of these animals, as found in different countries or places; but the Pipal, or the Surinam Toad, is too strange a creature not to require an exact description. There is not, perhaps, in all Nature, a more extraordinary phœnomenon, than that of an animal breeding and hatching its young in its back; from whence, as from a kind of hot-bed, they crawl one after the other, when come to maturity.

The pipal is in form more hideous than even the common toad; Nature seeming to have marked all those strange-mannered animals with peculiar deformity. The body is flat and broad; the head small; the jaws, like those of a mole, are extended, and evidently formed for rooting in the ground: the skin of the neck forms a sort of wrinkled collar: the colour of the head is of a dark chesnut, and the eyes are small: the back, which is very broad, is of a lightish gray, and seems covered over with a number of small eyes, which are round, and placed at nearly equal distances. These eyes are very different from what they seem; they are the animal's eggs, covered with their shells, and placed there for hatching. These eggs are buried deep in the skin, and in the beginning of incubation but just appear; and are very visible when the young animal is about to burst from its confinement. They are of a reddish shining yellow colour; and the spaces between them are full of small warts, resembling pearls.

This is their situation previous to their coming forth; but nothing so much demands our admiration, as the manner of their production. The eggs, when formed in the ovary, are sent by some internal canals, which anatomists have not hitherto described, to lie and come to maturity under the bony substance of the back: in this state they are impregnated by the male, whose seed finds its way by pores very singularly contrived, and pierces not only the skin but the periosteum. The skin, however, is still apparently entire, and forms a very thick covering over the whole brood; but as they advance to maturity, at different intervals, one after another, the egg seems to start forward and bourgeon from the back, becomes more yellow, and at last breaks, when the young one puts forth its head: it still, however, keeps its situation, until it has acquired a proper degree of strength, and then it leaves the shell, but still continues to keep upon the back of the parent. In this manner the pipal is seen travelling with her wonderous family on her back, in all the different stages of maturity. Some of the strange progeny, not yet come to sufficient perfection, appear quite torpid, and as yet without life in the egg: others seem just beginning to rise through the skin; here peeping forth from the shell; and there, having entirely forsaken their prison, some are sporting at large upon the parent's back; and others descending to the ground, to try their own fortune below.

Such is the description given us of this strange production by Seba, in which he differs from Ruysch, who affirms, that the young ones are bred in the back of the male only, where the female lays her eggs. I have followed Seba, however, not because he is better authority, but because he is more positive of the truth of his account, and asserts, assuredly, that the eggs are found on the back of the female only. Many circumstances, however, are wanting towards completing his information; such as a description of the passage by which the egg finds its way into the back; the manner of its fecundation; the time of gestation; as also a history of the manners of this strange animal itself: but, by a prolixity that too much prevails among naturalists at present, he leaves the most interesting object of curiosity, to give us a detailed description of the legs and claws of the pipal, about which we have very little concern.

The male pipal is every way larger than the female, and has the skin less tightly drawn round the body. The whole body is covered with pustules resembling pearls: and the belly, which is of a bright yellow, seems as if it were sewed up from the throat to the vent, a seam being seen to run in that direction. This animal, like the rest of the frog kind, is most probably harmless; though we are told of terrible effects resulting from its powder when calcined. This, however, must certainly be false; no creature, whatever, when calcined, can be poisonous; for the fire burns away whatever might have been dangerous in their composition: all animal substances, when calcined, being entirely the same.

BOOK II.

OF THE LIZARD KIND.

CHAPTER I.

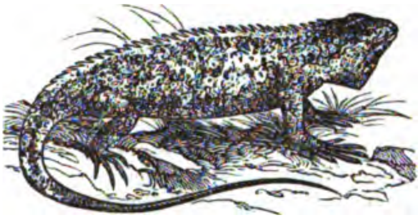
OF LIZARDS IN GENERAL.

THERE is scarce a naturalist, who has treated of lizards, but has a particular manner of ranking them in the scale of Animated Nature. Ray, rather struck with the number of their legs, than their habits and conformation, has exalted them among quadrupeds; while Linnæus, attentive only to their long slender forms, has degraded them among serpents. Brisson gives them a distinct class by themselves, under the name of *reptiles.*—Klein gives them a class inferior to beasts, under the name of *naked quadrupeds.* Some, in short, from their scaly covering, and fondness for the water, have given them to the fishes; while there have not been wanting naturalists who have classed them with insects, as the smaller kinds of this class seem to demand.

It is indeed no easy matter to tell to what class in Nature lizards are chiefly allied. They are unjustly raised to the rank of beasts, as they bring forth eggs, dispense with breathing, and are not covered with hair. They cannot be placed among fishes, as the majority of them live upon land: They are excluded from the serpent tribe, by their feet, upon which they run with some celerity; and from the insects, by their size; for though the Newt may be looked upon in this contemptible light, a Crocodile would be a terrible insect indeed. Thus lizards are, in some measure, excluded from every rank; while they exhibit somewhat of the properties of all; the legs and celerity of the quadruped; a facility of creeping through narrow and intricate ways, like the serpent; and a power of living in the water, like fishes; however though endued with these various powers, they have no real advantages over any other class of Animated Nature; for what they gain in aptitude for one element, they lose in their fitness for another. Thus, between both, they are an awkward, ungainly tribe; neither so alert upon land, nor so nimble in the water, as the respective inhabitants of either abode: and, indeed, this holds throughout all Nature, that in proportion as the seeming advantages of inferior animals are multiplied, their real ones are abridged; and all their instincts are weakened and lost, by the variety of channels into which they are divided.

As lizards thus differ from every other class of animals, they also differ widely from each other. With respect to size, no class of beings has its

Crocodile, p. 64.



Iguana, p. 75.

Flying Dragon, p. 77.

Common Lizard p. 74.

To face p. 62, vol. iv.

ranks so opposite. What, for instance, can be more removed than the small Chamelion, an inch long, and the alligator of the river Amazons, above twenty-seven feet? To an inattentive observer, they would appear entirely of different kinds; and Seba wonders how they ever came to be classed together.

The colour of these animals also is very various, as they are found of a hundred different hues—green, blue, red, chesnut, yellow, spotted, streaked, and marbled. Were colour alone capable of constituting beauty, the lizard would often please; but there is something so repressing in the animal's figure, that the brilliancy of its scales, or the variety of its spots, only tend to give an air of more exquisite venom or greater malignity. The figure of these animals is not less various: sometimes swollen in the belly; sometimes pursed up at the throat; sometimes with a rough set of spines on the back, like the teeth of a saw; sometimes with teeth, at others with none; sometimes venomous, at others harmless, and even philanthropic; sometimes smooth and even; sometimes with a long, slender tail; and often with a shorter blunt one.

But their greatest distinction arises from the manner of bringing forth their young. Firstly, some of them are viviparous. Secondly, some are oviparous; and which may be considered in three distinct ways. Thirdly, some bring forth small spawn, like fishes. The Crocodile, the Iguana, and all the largest kinds, bring forth eggs, which are hatched by the heat of the sun; the animals that issue from them are complete upon leaving the shell; and their first efforts are to run to seek food in their proper element. The viviparous kinds, in which are all the salamanders, come forth alive from the body of the female, perfect and active, and suffer no succeeding change. But those which are bred in the water, and, as we have reason to think, from spawn, suffer a very considerable change in their form. They are produced with an external skin or covering, that sometimes encloses their feet, and gives them a serpentine appearance. To this false skin fins are added, above and below the tail, that serve the animal for swimming; but when the false skin drops off, these drop off also; and then the lizard, with its four feet, is completely formed, and forsakes the water.

From hence it appears, that of this tribe there are three distinct kinds, differently produced, and most probably very different in their formation. But the history of these animals is very obscure; and we are as yet incapable of laying the line that separates them. All we know, as was said before, is, that the great animals of this kind are *mostly* produced perfect from the egg; the salamanders are *generally* viviparous; and *some* of the water lizards imperfectly produced. In all these most unfinished productions of Nature, if I may so call them, the varieties in their structure increases in proportion to their imperfections. A poet would say, that Nature grew tired of the nauseous formation; and left accident to finish the rest of her handy-work.

However, the three kinds have many points of similitude; and, in all their varieties of figure, colour, and production, this tribe is easily distinguished and strongly marked. They have all four short legs; the two forefeet somewhat resembling a man's hand and arm. They have tails almost as thick as the body at the beginning, and that generally run tapering to a point. They are all amphibious also; equally capable of living upon land and water; and formed internally in the same manner with the tortoise and other animals, that can continue a long time without respiration: in other words, their lungs are not so necessary to continue life and circulation, but that their play may be stopped for some considerable time, while the blood performs its circulation round the body by a shorter communication.

These are differences that sufficiently separate lizards from all other animals; but it will be very difficult to fix the limits that distinguish the three kinds from each other. The *crocodile* tribe, and its affinities, are sufficiently distinguished from all the rest, by their size and fierceness; the *salamander* tribe is distinguished by their deformity, their frog-like heads, the shortness of their snouts, their swollen belly, and their viviparous production. With regard to the rest, which we may denominate the chameleon or lizard kind, some of which bring forth from the egg, and some of which are imperfectly formed from spawn, we must group them under one head and leave time to unravel the rest of their history.

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CHAPTER II.

OF THE CROCODILE AND ITS AFFINITIES

THE Crocodile is an animal placed at a happy distance from the inhabitants of Europe, and formidable only in those regions where men are scarce, and arts are but little known. In all the cultivated and populous parts of the world, the great animals are entirely banished, or rarely seen. The appearance of such raises at once a whole country up in arms to oppose their force; and their lives generally pay the forfeit of their temerity. The crocodile, therefore, that was once so terrible along the banks of the river Nile, is now neither so large, nor its numbers so great as formerly. The arts of mankind have, through a course of ages, powerfully operated to its destruction; and, though it is sometimes seen, it appears comparatively timorous and feeble.

To look for this animal in all its natural terrors, grown to an enormous size, propagated in surprising numbers and committing unceasing devastations, we must go the uninhabited regions of Africa and America, to those immense rivers that roll through extensive and desolate kingdoms, where arts have never penetrated, where force only makes distinction, and the most powerful animals exert their strength with confidence and security. Those that sail up the river Amazons, or the river Niger, well know how numerous and terrible those animals are in such parts of the world.—In both these rivers they are found from eighteen to twenty-seven feet long, and sometimes lying as close to each other, as a raft of timber upon one of our streams. There they indolently bask on the surface, no way disturbed at the approach of an enemy, since, from the repeated trials of their strength, they found none that they were not able to subdue.

Of this terrible animal there are two kinds; the Crocodile properly so called, and the Cayman or Alligator. Travellers, however, have rather made the distinction than Nature; for in the general outline, and in the nature of these two animals, they are entirely the same. It would be speaking more properly to call these animals the Crocodiles of the eastern and the western world; for in books of voyages, they are so entirely confounded together, that there is no knowing whether the Asiatic animal be the crocodile of Asia, or the alligator of the western world. The distinctions usually made between the crocodile and alligator are these: the body of the crocodile is more slender than that of the alligator: its snout runs off tapering from the forehead, like that of a greyhound; while that of the other is indented like the nose of a lap-dog. The crocodile has a much wider swallow, and is of an ash-colour; the alligator is black varied with white, and is thought not to be so mischievous. All these distinctions, however, are very slight; and can be reckoned little more than minute variations.

This animal grows to a great length, being sometimes found thirty feet long, from the tip of the snout to the end of the tail; its most usual length, however, is eighteen.—One which was dissected by the Jesuits at Siam, was of the latter dimensions; and as the description which is given of it, both externally and internally, is the most accurate known of this noted animal, I must beg leave to give it as I find it, though somewhat tedious. It was eighteen feet and a half, French measure, in length; of which the tail was no less than five feet and a half, and the head and neck about two feet and a half. It was four feet nine inches in circumference, where thickest. The fore legs had the same parts and conformation as the arms of a man, both within and without. The hands, if they may be so called, had five fingers; the two last of which had no nails, and were of a conical figure. The hinder legs, including the thigh and paw, were two feet two inches long; the paws, from the joint to the extremity of the longest claws, were above nine inches: they were divided into four toes, of which three were armed with large claws, the longest of which was an inch and a half; these toes were united by a membrane, like those of a duck, but much thicker. The head was long, and had a little rising at the top: but the rest was flat, and especially towards the extremity of the jaws. It was covered by a skin, which adhered firmly to the skull and to the jaws. The skull was rough and unequal in several places; and about the middle of the forehead there were two bony crests, about two inches high: the skull between these two crests was proof against a musket-ball; for it only rendered the part a little white that it struck against. The eye was very small, in proportion to the rest of the body, and was so placed within its orbit, that the outward part, when the lid was closed, was only an inch long, and the line running parallel to the opening of the jaws. It was covered with a double lid, one within and one without: that within, like the nictitating membrane in birds, was folded in the great corner of the eye, and had a motion towards the tail, but being transparent, it covered the eye without hindering the sight. The iris was very large in proportion to the globe of the eye, and was of a yellowish grey colour. Above the eye the ear was placed, which opened from above downwards, as if it were by a kind of spring, by means of a solid, thick cartilaginous substance. The nose was placed in the middle of the upper jaw, near an inch from its extremity, and was perfectly round and flat, being near two inches in diameter, of a black, soft, spongy substance, not unlike the nose of a dog. The jaws seemed to shut one within another; and nothing can be more false than that the animal's under jaw is without motion; it moves like the lower jaw in all other animals, while the other is fixed to the skull and absolutely immoveable. The animal had twenty-seven cutting teeth in the upper jaw, and fifteen in the lower, with several void spaces between them: they were thick at the bottom, and sharp at the point, being all of different sizes, except ten large hooked ones, six of which were in the lower jaw, and four in the upper. The mouth was fifteen inches in length, and eight and a half in breadth, where broadest. The distance of the two jaws when opened as wide as they could be, was fifteen inches and a half: this is a very wide yawn, and could easily enough take in the body of a man. The colour of the body was of a dark brown on the upper part, and of a whitish citron below, with large spots of both colours on the sides. From the shoulders to the extremity of the tail, the animal was covered with large scales, of a square form, disposed like parallel girdles and fifty two in number; but those near the tale were not so thick as the rest. The creature was covered not only with these, but all over with a coat of armour; which, however, was not proof against a musket-ball, contrary to what has been commonly asserted: however, it must be confessed, that the attitude in which the animal was placed, might contribute to render the skin more penetrable; for, probably, if the ball had struck obliquely against the shell, it would have flown off. Those parts of the girdles underneath the belly were of a whitish colour, and were made up of scales of divers shapes, but not so hard as those on the back.

With respect to the internal parts of the animal the gullet was large in proportion to the mouth; and a ball of wood as large as one's head, readily ran down, and was drawn up again. The guts were but short in comparison, being not so long as the animal's body, The tongue, which some have erroneously asserted this animal was without, consisted of a thick, spongy, soft flesh, and was strongly connected to the lower jaw. The heart was of the size of a calf's, of a bright red colour, the blood passing as well from the veins to the aorta as into the lungs. There was no bladder; but the kidneys sent the urine to be discharged by the anus. There were sixty-two joints in the back-bone, which though very closely united, had sufficient play to enable the animal to bend like a bow to the right and the left; so that what we hear of escaping the creature by turning out of the right line, and of the animal's not being able to wheel readily after its prey, seems to be fabulous. It is most likely the crocodile can turn with ease, for the joints of its back are not stiffer than those of other animals, which we know, by experience, can wheel about very nimbly for their size.

Such is the figure and conformation of this formidable animal, that unpeoples countries, and makes the most navigable rivers desert and dangerous. They are seen, in some places, lying for whole hours, and even days, stretched in the sun, and motionless; so that one not used to them might mistake them for trunks of trees, covered with a rough and dry bark; but the mistake would soon be fatal, if not prevented: for the torpid animal, at the near approach of any living thing, darts upon it with instant swiftness, and at once drags it down to the bottom. In the times of an inundation, they sometimes enter the cottages of the natives, where the dreadful visitant seizes the first animal it meets with. There have been several examples of their taking a man out of a canoe in the sight of his companions, without their being able to lend him any assistance.

The strength of every part of the crocodile is very great; and its arms both offensive and defensive, irresistible. We have seen, from the shortness of its legs, the amazing strength of the tortoise! but what is the strength of such an animal compared to that of the crocodile, whose legs are very short, and whose size is so superior. The back-bone is jointed in the firmest manner; the muscles of the fore and hinder legs are vigorous and strong; and its whole form calculated for force. Its teeth are sharp, numerous, and formidable; it claws are long and tenacious; but its principal instrument of destruction is the tail; with a single blow of this it has often overturned a canoe, and seized upon the poor savage, its conductor.

Though not so powerful, yet it is very terrible even upon land. The crocodile seldom, except when pressed by hunger, or with a view of depositing its eggs, leaves the water. Its usual method is to float along upon the surface and seize whatever animals come within its reach; but when this method fails, it then goes closer to the bank. Disappointed of its fishy prey, it there waits covered up among the sedges, in patient expectation of some land animal that comes to drink; the dog, the bull, the tiger, or man himself. Nothing is to be seen of the insidious destroyer as the animal approaches; nor is its retreat discovered till it be too late for safety. It seizes the victim with a spring, and goes at a bound much faster than so unwieldy an animal could be thought capable of exerting; then having secured the creature with both teeth and claws, it drags it into the water, instantly sinks with it to the bottom, and, in this manner, quickly drowns it.

Sometimes it happens that the creature the crocodile has thus surprised escapes from its grasp wounded, and makes off from the river side. In such a case the tyrant pursues with all its force, and often seizes it a second time; for, though seemingly heavy, the crocodile runs with great celerity. In this manner it is sometimes seen above half a mile from the bank, in pursuit of an animal wounded beyond the power of escaping, and then dragging it back to the river-side, where it feasts in security.

It often happens, in its depredations along the bank, that the crocodile seizes on a creature as formidable as itself, and meets with a most desperate resistance. We are told of frequent combats between the crocodile and the tiger. All creatures of the tiger kind are continually oppressed by a parching thirst that keeps them in the vicinity of great rivers, whither they descend to drink very frequently. It is upon these occasions that they are seized by the crocodile; and they die not unrevenged. The instant they are seized upon, they turn with the greatest agility, and force their claws into the crocodile's eyes, while he plunges with his fierce antagonist into the river. There they continue to struggle for some time, till at last the tiger is drowned.

In this manner the crocodile seizes and destroys all animals, and is equally dreaded by all. There is no animal but man alone that can combat it with success. We are assured by Labat, that a negro with no other weapons than a knife in his right hand, and his left arm wrapped round with a cow-hide, ventures boldly to attack this animal in its own element. As soon as he approaches the crocodile, he presents his left arm, which the animal swallows most greedily; but sticking in its throat, the Negro has time to give it several stabs under the throat; and the water also getting in at the mouth, which is held involuntarily open, the creature is soon bloated up as big as a tun, and expires.

To us who live at a distance from the rapacity of these animals, these stories appear strange, and yet most probably are true. From not having seen any thing so formidable or bold in the circle of our own experience, we are not to determine upon the wonderful transactions in distant climates It is probable that these, and a number of more dreadful encounters, happen every day among those forests and in those rivers where the formidable animals are known to reside; where the elephant and the rhinoceros the tiger and the hippopotamos, the shark and the crocodile have frequent opportunities of meeting, and every day of renewing their engagements.

Whatever be the truth of these accounts, certain it is that crocodiles are taken by the Siamese in great abundance. The natives of that empire seem particularly fond of the capture of all the great animals with which their country abounds. We have already seen their success in taking and taming the elephant; nor are they less powerful in exerting their dominion over the crocodile. The manner of taking it in Siam, is by throwing three or four strong nets across a river, at proper distances from each other; so that if the animal breaks through the first it may be caught by one of the rest. When it is first taken, it employs the tail, which is the grand instrument of strength, with great force; but, after many unsuccessful struggles the animal's strength is at last exhausted. Then the natives approach the prisoner in boats, and pierce him with their weapons in the most tender parts, till he is weakened with the loss of blood. When he has done stirring, they begin by tying up his mouth, and with the same cord, they fasten his head to the tail, which last they bend back like a bow. However, they are not yet perfectly secure from his fury; but, for their greater safety, they tie his fore-feet, as well as those behind, to the top of his back. These precautions are not useless: for if they were to omit them, the crocodile would soon recover strength enough to do a great deal of mischief.

The crocodile, thus brought into subjection, or bred up young, is used to divert and entertain the great men of the East. It is often managed like a horse; a curb is put into its mouth, and the rider directs it as he thinks proper. Though awkwardly formed, it does not fail to proceed with some degree of swiftness; and is thought to move as fast as some of the most unwieldy of our own animals, the hog or the cow. Some, indeed, assert, that no animal could escape it, but for its difficulty in turning; but to this resource we could wish none would trust who are so unhappy as to find themselves in danger.

Along the rivers of Africa this animal is sometimes taken in the same manner as the shark. Several Europeans go together in a large boat, and throw out a piece of beef upon a hook and strong fortified line, which the crocodile seizing and swallowing, is drawn along floundering and struggling until its strength is quite exhausted, when it is pierced in the belly which is the tenderest part; and thus after numberless wounds, is drawn ashore. In this part of the world, also, as well as at Siam, the crocodile makes an object of savage pomp near the palaces of their monarchs. Philips informs us, that at Sabi, on the slave coast, there are two pools of water, near the royal palace, where crocodiles are bred, as we breed carp in our ponds in Europe.

Hitherto I have been describing the crocodile as it is found in unpeopled countries, and undisturbed by frequent encounters with mankind. In this state it is fierce and cruel, attacking every object that seems endued with motion : but in Egypt and other countries long peopled, where the inhabitants are civilized and the rivers frequented, this animal is solitary and fearful. So far from coming to attack a man it sinks at his approach with the utmost precipitation : and, as if sensible of superior power, ever declines the engagement. We have seen more than one instance in Animated Nature of the contempt which at first the lower orders of the creation have for man, till they have experienced his powers of destruction. The lion and the tiger among beasts, the whale among fishes, the albatross and the penguin among birds, meet the first encounters of man without dread or apprehension ; but they soon learn to acknowledge his superiority ; and take refuge from his power in the deepest fastnesses of Nature. This may account for the different characters which have been given us of the crocodile and the alligator, by travellers at different times ; some describing them as harmless and fearful ; as ever avoiding the sight of man, and preying only upon fishes ; others ranking them among the destroyers of Nature ; describing them as furnished with strength, and impelled by malignity to do mischief ; representing them as the greatest enemies of mankind, and particularly desirous of human prey. The truth is the animal has been justly described by both ; being such as it is found in places differently peopled or differently civilized. Wherever the crocodile has reigned long unmolested, it is there fierce, bold, and dangerous ; wherever it has been harrassed by mankind, its retreats invaded, and its numbers destroyed, it is there timorous and inoffensive.

In some places, therefore this animal instead of being formidable, is not only inoffensive but is cherished and admired. In the river San Domingo, the crocodiles are the most inoffensive animals in Nature ; the children play with them, and ride about on their backs ; they even beat them sometimes without receiving the smallest injury. It is true the inhabitants are very careful of this gentle breed and consider them as harmless domestics.

It is probable that the smell of musk, which all these animals exhale, may render them agreeable to the savages of that part of Africa.— They are often known to take the part of this animal which contains the musk, and wear it as a perfume about their persons. Travellers are not agreed in what part of the body these musk-bags are contained ; some say in the ears ; some in the parts of generation ; but the most probable opinion is, that this musky substance is amassed in the glands under the legs and arms. From whatsoever part of the body this odour proceeds, it is very strong and powerful, tincturing the flesh of the whole body with its taste and smell. The crocodile's flesh is at best very bad, tough eating ; but unless the musk-bags be separated, it is insupportable. The negroes themselves cannot well digest the flesh ; but then, a crocodile's egg is to them the most delicate morsel in the world. Even savages exhibit their epicures as well as we ; and one of true taste will spare neither pains nor danger to furnish himself with his favourite repast. For this reason he often watches the places where the female comes to lay her eggs, and upon her retiring, seizes the booty.

All crocodiles breed near fresh waters ; and though they are sometimes found in the sea, yet that may be considered rather as a place of excursion than abode. They produce their young by eggs, as was said above; and for this purpose the female when she comes to lay, chooses a place by the side of the river, or some fresh-water lake to deposit her brood in. She always pitches upon an extensive sandy shore, where she may dig a hole without danger of detection from the ground being fresh turned up. The shore must also be gentle and shelving to the water, for the greater convenience of the animal's going and returning; and a convenient place must be found near the edge of the stream, that the young may have a shorter way to go. When all these requisites are adjusted, the animal is seen cautiously stealing upon shore to deposit her burden. The presence of a man, a beast, or even a bird, is sufficient to deter her at that time: and if she perceives any creature looking on, she infallibly returns. If, however, nothing appears, she then goes to work, scratching up the sand with her fore-paws, and making a hole pretty deep in the shore. There she deposits from eighty to a hundred eggs, of the size of a tennis-ball, and of the same figure, covered with a tough, white, skin-like parchment.—She takes above an hour to perform this task; and then covering up the place so artfully that it can scarcely be perceived, she goes back to return again the next day. Upon her return, with the same precaution as before, she lays about the same number of eggs; and the day following also a like number. Thus having deposited her whole quantity, and having covered them close up in the sand, they are soon vivified by the heat of the sun; and at the end of thirty days, the young ones begin to break open the shell. At this time the female is instinctively taught that her young ones want relief; and she goes upon land to scratch away the sand and set them free. Her brood quickly avail themselves of their liberty; a part run unguided to the water; another part ascend the back of the female, and are carried thither in greater safety. But the moment they arrive at the water, all natural connection is at an end: when the female has introduced her young to their natural element not only she, but the male, become among the number of their most formidable enemies, and devour as many of them as they can. The whole brood scatters into different parts at the bottom; by far the greatest number are destroyed, and the rest find safety in their agility or minuteness.

But it is not the crocodile alone that is thus found to thin their numbers; the eggs of this animal are not only a delicious feast to the savage, but are eagerly sought after by every beast and bird of prey. The ichneumon was erected into a deity among the ancients for its success in destroying the eggs of these monsters: at present that species of the vulture called the Gallinazo is their most prevailing enemy. All along the banks of great rivers, for thousands of miles, the crocodile is seen to propagate in numbers that would soon overrun the earth, but for the vulture that seems appointed by Providence to abridge its fecundity. These birds are ever found in greatest numbers where the crocodile is most numerous; and hiding themselves within the thick branches of the trees that shade the banks of the river, they watch the female in silence, and permit her to lay all her eggs without interruption. Then when she has retired, they encourage each other with cries to the spoil; and flocking all together upon the hidden treasure, tear up the eggs and devour them in a much quicker time than they were deposited. Nor are they less diligent in attending the female while she is carrying her young to the water; for if any one of them happens to drop by the way, it is sure to receive no mercy.

Such is the extraordinary account given us by late travellers of the propagation of this animal; an account adopted by Linnæus and the most learned naturalists of the age*.—Yet, if one might argue from the general analogy of Nature, the crocodile's devouring her own young when she gets to the water seems doubtful. This may be a story raised from the general idea of this animal's rapacious cruelty; when, in fact, the crocodile only seems more cruel than other animals, because it has more power to do mischief. It is probable that it is not more divested of parental tenderness than other creatures; and I am the more led to think so from the peculiar formation of one of the crocodile kind. This is called the Open-Bellied Crocodile, and is furnished with a false belly like the opossum, where the young creep out and in, as their danger or necessities require. The crocodile thus furnished at least cannot be said to be an enemy to her own young, since she thus gives them more than parental protection. It is probable, also, that this open-bellied crocodile is viviparous, and fosters her young that are prematurely excluded in this second womb, until they come to proper maturity.

How long the crocodile lives we are not certainly informed; if we may believe Aristotle, it lives the age of man; but the ancients so much amused themselves in inventing fables concerning this animal, that even truth from them is suspicious. What we know for certain from the ancients is, that among the various animals that were produced to fight in the Amphitheatre at Rome, the combat of the crocodile was not wanting.† Marcus Scaurus produced them living in his unrivalled exhibitions; and the Romans considered him as the best citizen, because he furnished them with the most expensive entertainments. But entertainment at that corrupt time was their only occupation.

CHAPTER III.

OF THE SALAMANDER.

THE ancients have described a lizard that is bred from heat, that lives in the flames, and feeds upon fire as its proper nourishment. As they saw every other element, the air, the earth, and water inhabited, fancy was set to work to find or make an inhabitant in fire; and thus to people every part of Nature. It will be needless to say that there is no such animal existing; and that, of all others, the modern salamander has the smallest affinity to such an abode.

Whether the animal that now goes by the name of the salamander be the same with that described by Pliny, is a doubt with me; but this is not a place for the discussion. It is sufficient to observe, that the modern salamander is an animal of the lizard kind, and under this name is comprehended a large tribe that all go by the same name. There have been not less than seven sorts of this animal described by Seba; and to have some idea of the peculiarity of their figure, if we suppose the tail of a lizard applied to the body of a frog, we shall not be far from precision The common lizard is long, small and taper; the salamander, like the frog, has its eyes towards the back of the head; like the frog, its snout is round and not pointed, and its belly thick and swollen. The claws of its toes are short and feeble; its skin rough; and the tongue, unlike that of the smallest of the lizard kind, in which it is long and forked, is short, and adhering to the under jaw.

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* Ulloa. † Plin. lib. viii. c. 26.

But it is not in figure that this animal chiefly differs from the rest of the lizard tribe; for it seems to differ in nature and conformation. In nature it is unlike, being a heavy, torpid animal; whereas the lizard tribe are active, restless, and ever in motion: in conformation it is unlike, as the salamander is produced alive from the body of its parent, and is completely formed the moment of its exclusion. It differs from them also in its general reputation of being venomous: however, no trials that have been hitherto made seem to confirm the truth of the report.

Not only this, but many others of the lizard tribe are said to have venom; but it were to be wished that mankind, for their own happiness, would examine into the foundation of this reproach. By that means many of them, that are now shunned and detested, might be found inoffensive; their figure, instead of exciting either horror or disgust, would then only tend to animate the general scene of Nature; and speculation might examine their manners in confidence and security. Certain it is, that all of the lizard kind with which we are acquainted in this country, are perfectly harmless; and it is equally true that, for a long time, till our prejudices were removed, we considered not only the Newt, but the Snake and the Blind-worm, as fraught with the most destructive poison. At present we have got over these prejudices; and, it is probable, that if other nations made the same efforts for information, it would be found, that the malignity of most, if not all, of the lizard tribe, was only in the imagination.

With respect to the Salamander, the whole tribe, from the Moron to the Gekko, are said to be venomous to the last degree; yet, when experiments have been tried, no arts, no provocations, could excite these animals to the rage of biting. They seem timid and inoffensive, only living upon worms and insects; quite destitute of fangs, like the viper; their teeth are so very small, that they are hardly able to inflict a wound. But as the teeth are thus incapable of offending, the people of the countries where they are found have recourse to a venomous slaver, which, they suppose, issues from the animal's mouth; they also tell us of a venom issuing from the claws: even Linnæus seems to acknowledge the fact; but thinks it a probable supposition that this venom may proceed from their urine.

Of all animals, the Gekko is the most notorious for its powers of mischief; yet, we are told by those who load it with that calumny, that it is very friendly to man, and though supplied with the most deadly virulence, is yet never known to bite. It would be absurd in us, without experience, to pronounce upon the noxious or inoffensive qualities of animals; yet it is most probable, from an inspection of the teeth of lizards, and from their inoffensive qualities in Europe, that the gekko has been unjustly accused and that its serpent-like figure has involved it in one common reproach with serpents.

The salamander, best known in Europe, is from eight to eleven inches long, usually black, spotted with yellow; and when taken in the hand, feeling cold to a great degree.—There are several kinds. Our Black Water Newt is reckoned among the number. The idle report of its being inconsumable in fire, has caused many of these poor animals to be burnt; but we cannot say, as philosophical martyrs; since scarce any philosopher could think it necessary to make the experiment. When thrown into the fire, the animal is seen to burst with the heat of its situation, and to eject its fluids. We are gravely told, in the Philosophical Transactions, that this is a method the animal takes to extinguish the flames!

When examined internally, the salamander exhibits little difference from other animals of the lizard kind. It is furnished with lungs that sometimes serve for the offices of breathing; with a heart that has its communications open, so that the animal cannot easily be drowned. The ovary in the female is double the size of what it is in others of this tribe; and the male is furnished with four testiculi instead of two. But what deserves particular notice is the manner of this animal's bringing forth its young alive.* "The salamander," says my author, "begins to show itself in the spring, and chiefly during heavy rains. When the warm weather returns it disappears; and never leaves its hole, during either great heats or severe colds, both which it equally fears. When taken in the hand, it appears like a lump of ice; it consequently loves the shade, and is found at the feet of old trees surrounded with brushwood at the bottom. It is fond of running along new-ploughed grounds; probably to seek for worms, which are its ordinary food. One of these," continues my author, "I took alive some years ago in a ditch that had been lately made. I laid it at the foot of the stairs upon coming home, and there it disgorged from the throat a *worm* three inches long, that lived for an hour after, though wounded as I suppose by the teeth of the animal. I afterward cut up another of these lizards, and saw not less than fifty young ones, resembling the parent, come from its womb, all alive, and actively running about the room." It were to be wished the author had used another word beside that of *worm;* as we now are in doubt whether he means a real worm, or a young amimal of the lizard species: had he been more explicit, and had it appeared that it was a real young lizard, which I take to be his meaning, we might here see a wonder of Nature, brought to the proof, which many have asserted, and many have thought proper to deny: I mean the refuge which the young of the shark, the lizard, and the viper kinds, are said to take, by running down the throat of the parent, and there finding a temporary security. The fact, indeed, seems a little extraordinary; and yet it is so frequently attested by some, and even believed by others, whose authority is respectable, among the number of whom we find Mr. Pennant, that the argument of strangeness must give way to the weight of authority.

However this be, there is no doubt of the animal's being viviparous, and producing about fifty at a time. They come from the parent in full perfection, and quickly leave her to shift for themselves. These animals, in the lower ranks of Nature, want scarce any help when excluded; they soon complete the little circle of their education; and in a day or two are capable of practising all the arts of subsistence and evasion practised by their kind.

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* Acta Hafniensia, ann. 1676. Observ. 11. Memoirs de l'Académie Royale de Sciences, tom iii. part 3, p. 80.

They are all amphibious, or at least found capable of subsisting in either element, when placed there: if those taken from land are put into water, they continue there in seeming health; and, on the contrary, those taken from the water will live upon land. In water, however, they exhibit a greater variety in their appearance; and what is equally wonderful with the rest of their history, during the whole spring and summer this water-lizard changes its skin every fourth or fifth day; and during the winter every fifteen days. This operation they perform by means of the mouth and the claws; and it seems a work of no small difficulty and pain. The cast skins are frequently seen floating on the surface of the water: they are sometimes seen also with a part of their old skins still sticking to one of their limbs, which they have not been able to get rid of; and thus, like a man with a boot half drawn, in some measure crippled in their own spoils. This also often corrupts, and the leg drops off; but the animal does not seem to feel the want of it, for the loss of a limb to all the lizard kind is but a trifling calamity. They can live for several hours even after the loss of their heads: and for some time under dissection, all the parts of this animal seem to retain life: but the tail is the part that longest retains its motion. Salt seems to be much more efficacious in destroying these animals, than the knife; for, upon being sprinkled with it, the whole body emits a viscous liquor, and the lizard dies in three minutes in great agonies.

The whole of the lizard kind are also tenacious of life in another respect, and the salamander among the number. They sustain the want of food in a surprising manner. One of them, brought from the Indies, lived nine months without any other food than what it received from licking a piece of earth on which it was brought over:* another was kept by Seba in an empty vial for six months, without any nourishment; and Rhedi talks of a large one brought from Africa, that lived for eight months, without taking any nourishment whatever. Indeed, as many of this kind, both salamanders and lizards, are torpid, or nearly so, during the winter, the loss of their appetite for so long a time is the less surprising.

CHAPTER IV.

OF THE CHAMELION, THE IGUANA, AND LIZARDS OF DIFFERENT KINDS.

IT were to be wished that animals could be so classed, that by the very mentioning their rank, we should receive some insight into their history. This I have endeavoured in most instances; but in the present chapter all method is totally unserviceable. Here distribution gives no general ideas: for some of the animals to be here mentioned, produce by eggs; some by spawn; and some are viviparous. The peculiar manner of propagating in each, is very indistinctly known. The Iguana and the Chamelion, we know bring forth eggs; some others also produce in the same manner: but of the rest, which naturalists make to amount to above fifty, we have but very indistinct information.

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* Phil. Trans. ann. 1661, N. 21. art 7

In the former divisions of this tribe, we had to observe upon animals, formidable from their size, or disgusting from their frog-like head and appearance; in the present division, all the animals are either beautiful to the eye, or grateful to the appetite. The lizards, properly so called, are beautifully painted and mottled; their frolicksome agility is amusing to those who are familiar with their appearance; and the great affection which some of them show to man, should, in some measure, be repaid with kindness. Others, such as the Iguana, though not possessed of beauty, are very serviceable, furnishing one of the most luxurious feasts the tropical climates can boast of. Those treated of before were objects of curiosity, because they were apparently objects of danger: most of these here mentioned have either use or beauty to engage us.

Directly descending from the crocodile, we find the Cordyle, the Tockay and the Tejuguacu, all growing less in order, as I have named them These fill up the chasm to be found between the crocodile and the African iguana.

The Iguana, which deserves our notice, is about five feet long, and the body about as thick as one's thigh: the skin is covered with small scales, like those of a serpent; and the back is furnished with a row of prickles, that stand up, like the teeth of a saw: the eyes seem to be but half opened, except when the animal is angry, and then they appear large and sparkling: both the jaws are full of very sharp teeth, and the bite is dangerous though not venomous, for it never lets loose till it is killed. The male has a skin hanging under his throat, which reaches down to his breast; and when displeased, he puffs it up like a bladder: he is one-third larger and stronger than the female; though the strength of either avails them little towards their defence. The males are ash-coloured, and the females are green.

The flesh of these may be considered as the greatest delicacy of Africa and America; and the sportsmen of these climates go out to hunt the iguana as we do in pursuit of the pheasant or the hare. In the beginning of the season, when the great floods of the tropical climates are past away, and vegetation starts into universal verdure, the sportsmen are seen, with a nooze and a stick, wandering along the sides of the rivers to take the iguana. This animal, though apparently formed for combat, is the most harmless creature of all the forest: it lives among the trees, or sports in the water, without ever offering to offend; there, having fed upon the flowers of the mahot, and the leaves of the mapou, that grow along the banks of the stream, it goes to repose upon the branches of the trees that hang over the water. Upon land the animal is swift of foot; but when once in possession of a tree, it seems conscious of the security of its situation, and never offers to stir. There the sportsman easily finds it, and as easily fastens his noose round his neck: if the head be placed in such a manner that the noose cannot readily be fastened, by hitting the animal a blow on the nose with the stick, it lifts the head, and offers it in some manner to the noose. In this manner, and also by the tail, the iguana is dragged from the trees, and killed by repeated blows on the head

The Chamelion is a very different animal; and as the iguana satisfies the appetites of the epicure, this is rather the feast of the philosopher. Like the crocodile, this little animal proceeds from an egg; and it also nearly resembles that formidable creature in form: but it differs widely in its size and its appetites; being not above eleven inches long, and delighting to sit upon the trees, being afraid of serpents, from which it is unable to escape on the ground.

The head of a large chamelion is almost two inches long; and from thence to the beginning of the tail, four and a half; the tail is five inches long, and the feet two and a half: the thickness of the body is different at different times; for sometimes, from the back to the belly, it is two inches, and sometimes but one; for it can blow itself up, and contract itself, at pleasure. This swelling and contraction is not only of the back and belly but of the legs and tail.

These different tumours do not proceed from a dilatation of the breast in breathing, which rises and falls by turns; but are very irregular, and seem adopted merely from caprice. The chamelion is often seen, as it were, blown up for two hours together; and then it continues growing less and less insensibly; for the dilatation is always more quick and visible than the contraction. In this last state the animal appears extremely lean; the spine of the back seems sharp, and all the ribs may be counted; likewise the tendons of the lungs and arms may be seen very distinctly.

This method of puffing itself up, is similar to that in pigeons, whose crops are sometimes greatly distended with air. The chamelion has a power of driving the air it breathes over every part of the body; however, it only gets between the skin and the muscles; for the muscles themselves are never swollen. The skin is very cold to the touch; and though the animal seems so lean, there is no feeling the beating of the heart. The surface of the skin is unequal, and has a grain not unlike shagreen, but very soft, because each eminence is as smooth as if it were polished. Some of these little protuberances are as large as a pin's head, on the arms, legs, belly, and tail; but on the shoulders and head they are of an oval figure, and a little larger: those under the throat are ranged in the form of a chaplet, from the lower lid to the breast. The colour of all these eminences, when the chamelion is at rest in a shady place, is of a bluish grey, and the space between is of a pale red and yellow.

But when the animal is removed into the sun, then comes the wonderful part of its history. As first it appears to suffer no change of colour, its grayish spots still continuing the same: but the whole surface soon seems to imbibe the rays of light; and the simple colouring of the body changes into a variety of beautiful hues. Wherever the light comes upon the body, it is of a tawny brown; but that part of the skin on which the sun does not shine changes into several, brighter colours, pale yellow, or vivid crimson; which forms spots of the size of half one's finger: some of these descend from the spine half way down the back; and others appear on the sides, arms, and tail. When the sun has done shining, the original gray colour returns by degrees, and covers all the body. Sometimes the animal becomes all over spotted with brown spots, of a greenish cast. When it is wrapt up in a white linen cloth for two or three minutes, the natural colour becomes much lighter; but not quite white, as some authors have pretended: however, from hence it must not be concluded that the chamelion assumes the colour of the objects which it approaches; this is entirely an error, and probably has taken its rise from the continual changes it appears to undergo.

Le Bruyn, in his voyage to the Levant, has given us a very ample description of the chamelion. During his stay at Smyrna, he brought several of this kind, and, to try how long they could live, kept four of them in a cage, permitting them at times to run about the house. The fresh sea-breeze seemed to give them most spirits and vivacity; they opened their mouths to take it in; he never perceived that they eat any thing, except now and then a fly, which they took half an hour to swallow: he observed their colour often to change, three or four times successively, without being able to find out any cause for such alterations; their common colour he found to be gray, or rather a pale mouse colour; but its most frequent changes were into a beautiful green, spotted with yellow; sometimes the animal was marked all over with dark-brown; and this often changed into a lighter brown; some colours, however, it never assumed, and contrary to what was said above he found red to be among the number.

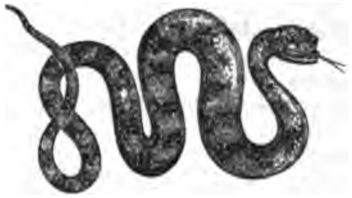
Though our traveller took the utmost care, he was unable to preserve any of them alive above five months; and many of them died in four. When the chamelion changes place, and attempts to descend from an eminence, it moves with the utmost precaution, advancing one leg very deliberately before the other, still securing itself by holding whatever it can grasp by the tail. It seldom opens its mouth except for fresh air; and when that is supplied discovers its satisfaction by its motions, and the frequent changes of its colour. The tongue is sometimes darted out after its prey, which is flies; and this is as long as the whole body. The eyes are remarkably little, though they stand out of the head; they have a single eye-lid, like a cap with a hole in the middle, through which the sight of the eye appears, which is of a shining brown; and round it there is a little circle of gold colour; but the most extraordinary part of their conformation is that the animal often moves one eye when the other is entirely at rest; nay, sometimes one eye will seem to look directly forward, while the other looks backward: and one will look upwards while the other regards the earth.

To this class of lizards, we may refer the Dragon, a most terrible animal, but most probably not of Nature's formation. Of this death-dealing creature all people have read; and the most barbarous countries, to this day, paint it to the imagination in all its terrors, and fear to meet it in every forest. It is not enough that nature has furnished those countries with poisons of various malignity; with serpents forty feet long; with elephants, lions, and tigers, to make their situation really dangerous; the capricious imagination is set at work to call up new terrors; and scarce a savage is found, that does not talk of winged serpents of immoderate length, flying away with the camel or the rhinoceros, or destroying mankind by a single glare. Happily, however, such ravages are no where found to exist at present; and the whole race of dragons is dwindled down to the Flying Lizard, a little harmless creature, that only preys upon insects, and even seems to embellish the forest with its beauty.

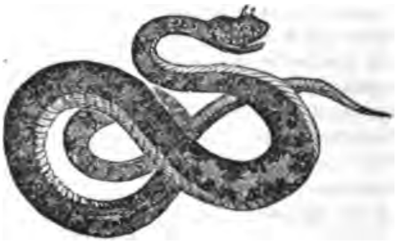
The Flying Lizard of Java perches upon fruit-trees, and feeds upon flies, ants, butterflies, and other small insects. It is a very harmless creature, and does no mischief in any respect. Gentil, in his Voyage round th

World, affirms, that he has seen these lizards at the island of Java, in the East Indies. He observed they flew very swiftly from tree to tree; and having killed one, he could not but admire the skin, which was painted with several beautiful colours: it was a foot in length, and had four paws, ike the common lizards; but its head was flat, and had a small hole in he middle; the wings were very thin, and resemble those of a flying fish. About the neck were a sort of wattles, not unlike those of cocks, which ave it no disagreeable appearance. He intended to have preserved it, in order to bring it into Europe; but it was corrupted by the heat, before the close of the day; however, they have since been brought into England, and are now common enough in the cabinets of the curious.

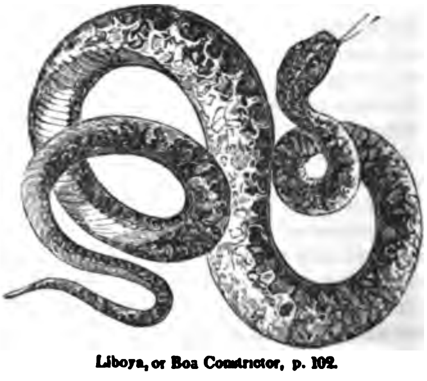
The last animal of the lizard kind that I shall mention, is the Chalcidian Lizard of Aldrovandus, very improperly called the Seps by modern historians. This animal seems to make the shade that separates the lizard from the serpent race. It has four legs like the lizard; but so short as to be utterly unserviceable in walking: it has a long slender body, like the serpent; and is said to have the serpent's malignity also. The fore legs are very near the head; the hind legs are placed far backward; but before and behind they seem rather useless incumbrances, than instruments serving to assist the animal in its motions, or in providing for its subsistence. These animals are found above three feet long, and thick in proportion, with a large head and pointed snout. The whole body is covered with scales; and the belly is white, mixed with blue. It has four crooked teeth, as also a pointed tail, which, however, can inflict no wound. Whether the teeth be similar to the viper's fangs, we are not told; though Volteranus says they are covered with a membrane; by which I am ap to think he means a venom-bag, which is found at the root of the teeth of all serpents that are poisonous. It is viviparous; fifteen young ones having been taken alive out of its belly. Upon the whole, it appears to bear a strong affinity to the viper; and, like that animal, its bite may be dangerous.



European Viper, p. 95.



Horned Viper, p. 95.



Liboya, or Boa Constrictor, p. 102.

To face p. 79, vol. iv

BOOK III.

OF SERPENTS, &c.

CHAPTER I.

OF SERPENTS IN GENERAL.

WE now come to a tribe that not only their deformity, their venom, their ready malignity, but also our prejudices, and our very religion, have taught us to detest. The serpent has from the beginning been the enemy of man; and it has hitherto continued to terrify and annoy him, notwithstanding all the arts that have been practised to destroy it. Formidable in itself, it deters the invader from the pursuit; and from its figure capable of finding shelter in a little space, it is not easily discovered by those who would venture to try the encounter. Thus possessed at once of potent arms and inaccessible or secure retreats, it baffles all the arts of man, though never so earnestly bent upon its destruction.

For this reason, there is scarce a country in the world that does not still give birth to this poisonous brood, that seem formed to quell human pride, and repress the boasts of security. Mankind have driven the lion, the tiger, and the wolf, from their vicinity; but the snake and the viper still defy their power, and frequently punish their insolence.

Their numbers, however, are thinned by human assiduity; and it is possible some of the kinds are wholly destroyed. In none of the countries of Europe are they sufficiently numerous to be truly terrible; the philosopher can meditate in the fields without danger, and the lover seek the grove without fearing any wounds but those of metaphor. The various malignity that has been ascribed to European serpents of old, is now utterly unknown; there are not above three or four kinds that are dangerous, and their poison operates in all in the same manner. A burning pain in the part, easily removeable by timely applications, is the worst effect that we experience from the bite of the most venomous serpents of Europe. The drowsy death, the starting of the blood from every pore, the insatiable and burning thirst, the melting down the solid mass of the whole form into one heap of putrefaction, these are horrors with which we are entirely unacquainted.

But though we have thus reduced these dangers, having been incapable of wholly removing them, in other parts of the world they still rage with all their ancient malignity. Nature seems to have placed them as sentinels to deter mankind from spreading too widely, and from seeking new abodes till they have thoroughly cultivated those at home. In the warm countries that lie within the tropic, as well as the cold regions of the north, where the inhabitants are few, the serpents propagate in equal proportion. But of all countries, those regions have them in the greatest abundance where the fields are unpeopled and fertile, and where the climate supplies warmth and humidity. All along the swampy banks of the river Niger or Oroonoko, where the sun is hot, the forests thick, and the men but few, the serpents cling among the branches of the trees in infinite numbers, and carry on an unceasing war against all other animals in their vicinity. Travellers have assured us that they have often seen large snakes twining round the trunk of a tall tree encompassing it like a wreath, and thus rising and descending at pleasure. In these countries, therefore, the serpent is too formidable to become an object of curiosity, for it excites much more violent sensations.

We are not, therefore, to reject as wholly fabulous, the accounts left us by the ancients, of the terrible devastations committed by a single serpent. It is probable, in early times when the arts were little known, and mankind were but thinly scattered over the earth, that serpents, continuing undisturbed possessors of the forest, grew to an amazing magnitude; and every other tribe of animals fell before them. It then might have happened, that serpents reigned the tyrants of a district for centuries together. To animals of this kind, grown by time and rapacity to a hundred or a hundred and fifty feet in length, the lion, the tiger, and even the elephant itself, were but feeble opponents. The dreadful monster spread desolation round him; every creature that had life was devoured or fled to a distance. The horrible *fœtor* which even the commonest and most harmless snakes are still found to diffuse, might in these larger ones, become too powerful for any living being to withstand; and while they preyed without distinction, they might thus also have poisoned the atmosphere around them. In this manner, having for ages lived in the hidden and unpeopled forest, and finding, as their appetites were more powerful, the quantity of their prey decreasing, it is possible they might venture boldly from their retreats, into the more cultivated parts of the country, and carry consternation among mankind, as they had before desolation among the lower ranks of Nature. We have many histories of antiquity, presenting us such a picture; and exhibiting a whole nation sinking under the ravages of a single serpent. At that time man had not learned the art of uniting the efforts of many, to effect one great purpose. Opposing multitudes only added new victims to the general calamity, and increased mutual embarrassment and terror. The animal was therefore to be singly opposed by him who had the greatest strength, the best armour and the most undaunted courage. In such an encounter, hundreds must have fallen; till one, more lucky than the rest, by a fortunate blow, or by taking the monster in its torpid interval, and surcharged with spoil, might kill, and thus rid his country of the destroyer. Such was the original occupation of heroes; and those who first obtained that name, from their destroying the ravagers of the earth, gained it much more deservedly than their successors, who acquired their reputation only for their skill in destroying each other. But as we descend into more enlightened antiquity, we find these animals less formidable, as being attacked in a more successful manner. We are told that while Regulus led his army along the banks of the river Bagrada, in Africa, an enormous serpent disputed his passage over. We are assured by Pliny, who says that he himself saw the skin, that it was a hundred and twenty feet long, and that it had destroyed many of the army. At last, however, the battering engines were brought out against it; and these assailing it at a distance, it was soon destroyed. Its spoils were carried to Rome, and the general was decreed an ovation for his success. There are, perhaps, few facts better ascertained in history than this: an ovation was a remarkable honour; and was given only for some signal exploit, that did not deserve a triumph: no historian would offer to invent that part of the story at least, without being subject to the most shameful detection. The skin was kept for several years after in the Capitol; and Pliny says, he saw it there; now, though Pliny was a credulous writer, he was by no means a *false* one; and whatever he says he has seen, we may very safely rely on. At present, indeed, such ravages from serpents are scarce seen in any part of the world; not but that in Africa and America, some of them are powerful enough to brave the assaults of men to this day.

But happily for us, we are placed at such a distance as to take a view of this tribe, without fearing for our safety; we can survey their impotent malignity with the same delight with which the poet describes the terrors of a dead monster.

> Nequeant expleri corda tuendo
> Terribiles oculos villosaque setis pectora.

To us their slender form, their undulating motion, their vivid colouring, their horrid stench, their forky tongue, and their envenomed fangs, are totally harmless; and in this country their uses even serve to counterbalance the mischief they sometimes occasion.

If we take a survey of serpents in general, they have marks by which they are distinguished from all the rest of animated nature. They have the length and the suppleness of the eel, but want fins to swim with; they have the scaly covering and pointed tail of the lizard, but they want legs to walk with: they have the crawling motion of the worm, but, unlike that animal, they have lungs to breathe with: like all the reptile kind, they are resentful when offended: and Nature has supplied them with terrible arms to revenge every injury.

Though they are possessed of very different degrees of malignity, yet they are all formidable to man, and have a strong similitude of form to each other; and it will be proper to mark the general characters before we descend to particulars. With respect to their conformation, all serpents have a very wide mouth, in proportion to the size of the head; and what is very extraordinary, they can gape and swallow the head of another animal which is three times as big as their own. I have seen a toad taken out of the belly of a snake, at Lord Spencer's, near London, the body of which was thrice the diameter of the animal that swallowed it. However, it is no way surprising that the skin of the snake should stretch to receive so large a morsel; the wonder seems how the jaws could take it in. To explain this, it must be observed that the jaws of this animal do not open as ours, in the manner of a pair of hinges, where bones are applied to bones and play upon one another; on the contrary, the serpent's jaws are held together at the roots, by a stretching muscular skin;

by which means they open as widely as the animal chooses to stretch them, and admit of a prey much thicker than the snake's own body. The throat, like stretching leather, dilates to admit the morsel; the stomach receives it in part; and the rest remains in the gullet, till putrefaction and the juices of the serpent's body unite to dissolve it.

As to the teeth, I will talk more of them when I come to treat of the viper's poison; it will be sufficient here to observe, that some serpents have fangs, or canine teeth, and others are without them. The teeth in all are crooked and hollow; and, by a peculiar contrivance, are capable of being erected or depressed at pleasure.

The eyes of all serpents are small, if compared to the length of the body; and though differently coloured in different kinds, yet the appearance of all is malign and heavy; and from their known qualities, they strike the imagination with the idea of a creature meditating mischief. In some, the upper eye-lid is wanting, and the serpent winks only with that below; in others, the animal has a nictitating membrane or skin, resembling that which is found in birds, which keeps the eye clean and preserves the sight. The substance of the eye in all is hard and horny; the crystaline humour occupying a great part of the globe.

The holes for hearing are very visible in all: but there are no conduits for smelling; though it is probable that some of them enjoy that sense in tolerable perfection.

The tongue in all these animals is long and forky. It is composed of two long fleshy substances, which terminate in sharp points, and are very pliable. At the root it is connected very strongly to the neck by two tendons, that give a variety of play. Some of the viper kind have tongues a fifth part of the length of their bodies; they are continually darting them out, but they are entirely harmless, and only terrify those who are ignorant of the real situation of their poison.

If from the jaws we go on to the gullet, we shall find it very wide for the animal's size, and capable of being distended to a great degree; at the bottom of this lies the stomach, which is not so capacious, and receives only a part of the prey, while the rest continues in the gullet for digestion. When the substance in the stomach is dissolved into chyle, it passes into the intestines, and from thence goes to nourishment, or to be excluded by the vent.

Like most other animals, serpents are furnished with lungs, which I suppose are serviceable in breathing, though we cannot perceive the manner in which this operation is performed; for though serpents are often seen apparently to draw in their breath, yet we cannot find the smallest signs of their ever respiring it again. Their lungs, however, are long and large, and doubtless are necessary to promote their languid circulation. The heart is formed as in the tortoise, the frog, and the lizard kinds, so as to work without the assistance of the lungs. It is single, the greatest part of the blood flowing from the great vein to the great artery by the shortest course. By this contrivance of Nature we easily gather two consequences; that snakes are amphibious, being equally capable of living on land and in the water; and, that also they are torpid in winter like the bat, the lizard, and other animals formed in the same manner.

The vent in these animals serves for the emission of the urine and the fæces, and for the purposes of generation. The instrument of generation in the male is double, being forked like the tongue; the ovaries in the female are double also; and the aperture is very large, in order to receive the double instrument of the male. They copulate in their retreats; and it is said by the ancients that in this situation they appear like one serpent with two heads; but how far this remark is founded in truth, I do not find any of the moderns that can resolve me.

As the body of this animal is long, slender, and capable of bending in every direction, the number of joints in the back-bone are numerous beyond what one would imagine. In the generality of quadrupeds, they amount to not above thirty or forty; in the serpent kind they amount to a hundred and forty-five from the head to the vent, and twenty-five more from that to the tail.* The number of these joints must give the back bone a surprising degree of pliancy; but this is still increased by the manner in which each of these joints are locked into the other. In man and quadrupeds, the flat surface of the bones are laid one against the other, and bound tight by sinews; but in serpents the bones play one within the other like ball and socket, so that they have full motion upon each other in every direction.† Thus, if a man were to form a machine composed of so many joints as are found in the back of a serpent, he would find it no easy matter to give it such strength and pliancy at the same time. The chain of a watch is but a bungling piece of workmanship in comparison.

Though the number of joints in the back-bone is great, yet that of the ribs is still greater; for, from the head to the vent, there are two ribs to every joint, which makes their number two hundred and ninety in all. These ribs are furnished with muscles, four in number; which being inserted into the head, run along to the end of the tail, and give the animal great strength and agility in all its motions.

The skin also contributes to its motions, being composed of a number of scales, united to each other by a transparent membrane, which grows harder as it grows older, until the animal changes, which is generally done twice a year. This cover then bursts near the head, and the serpent creeps from it, by an undulatory motion, in a new skin, much more vivid than the former, If the old slough be then viewed, every scale will be distinctly seen, like a piece of net work, and will be found greatest where the part of the body they covered was largest.

There is much geometrical neatness in the disposal of the serpent's scales, for assisting the animal's sinuous motion. As the edges of the foremost scales lie over the ends of the following scales, so those edges, when the scales are erected, which the animal has a power of doing in a small degree, catch in the ground, like nails in the wheel of a chariot, and so promote and facilitate the animal's progressive motion. The erecting these scales is by means of a multitude of distinct muscles, with which each is supplied, and one end of which is tacked each to the middle of the foregoing.

In some of the serpent kind there is the exactest symmetry in these scales; in others they are disposed more irregularly. In some there are larger scales on the belly, and often answering to the number of ribs; in others, however the animal is without them. Upon this slight difference,

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* Vide Charat. Anatom.

† Derham, p. 386.

Linnæus has founded his distinctions of the various classes of the serpent tribe. Human curiosity, however, and even human interest, seem to plead for a very different method of distribution. It is not the number of scales on a formidable animal's belly, nor their magnitude or variety, that any way excite our concern. The first question that every man will naturally ask, when he hears of a snake, is, whether it be large? the second, whether it be venomous? In other words, the strongest lines in the animal's history are those that first excite our attention; and these it is every historian's business to display.

When we come to compare serpents with each other, the first great distinction appears in their size; no other tribe of animals differing so widely in this particular. What, for instance, can be so remotely separated as the Great Liboya of Surinam, that grows to thirty-six feet long; and the Little Serpent, of the Cape of Good Hope, and the north of the river Senegal, that is not above three inches, and covers whole sandy deserts with its multitudes! This tribe of animals, like that of fishes, seems to have no bounds put to their growth: their bones are in a great measure cartilaginous, and they are consequently capable of great extension; the older, therefore a serpent becomes, the larger it grows, and as they seem to live to a great age, they arrive at an enormous size.

Leguat assures us, that he saw one in Java, that was fifty feet long. Carli mentions their growing to above forty feet, and we have now the skin of one in the Musæum, that measures thirty-two. Mr. Wentworth, who had large concerns in the Berbices in America, assures me, that, in that country they grow to an enormous length. He one day sent out a soldier, with an Indian, to kill wild fowl for the table; and they accordingly went some miles from the fort: in pursuing their game, the Indian, who generally marched before, beginning to tire, went to rest himself upon the fallen trunk of a tree, as he supposed it to be; but when he was just going to sit down, the enormous monster began to move, and the poor savage perceiving that he had approached a Liboya, the greatest of all the serpent kind, dropped down in an agony. The soldier, who perceived at some distance what had happened, levelled at the serpent's head, and, by a lucky aim, shot it dead: however, he continued his fire until he was assured that the animal was killed; and then going up to rescue his companion, who was fallen motionless by its side, he, to his astonishment, found him dead likewise, being killed by the fright. Upon his return to the fort, and telling what had happened, Mr. Wentworth ordered the animal to be brought up, when it was measured, and found to be thirty-six feet long. He had the skin stuffed, and then sent to Europe, as a present to the Prince of Orange, in whose cabinet it is now to be seen at the Hague; but the skin has shrunk, by drying, two or three feet.

In the East Indies they grow also to an enormous size; particularly in the Island of Java, where, we are assured, that one of them will destroy and devour a buffalo. In a letter printed in the German Ephemerides, we have an account of a combat between an enormous serpent and a buffalo, by a person, who assures us, that he was himself a spectator. The serpent had for some time been waiting near the brink of a pool, in expectation of its prey; when a buffalo was the first that offered. Having darted upon the affrighted animal, it instantly began to wrap it round with its voluminous twistings; and at every twist the bones of the buffalo were heard to crack almost as loud as the report of a cannon. It was in vain that the poor animal struggled and bellowed; its enormous enemy entwined it too closely to get free; till at length, all its bones being mashed to pieces, like those of a malefactor on the wheel, and the whole body reduced to one uniform mass, the serpent untwined its folds to swallow its prey at leisure. To prepare for this, and in order to make the body slip down the throat more glibly, it was seen to lick the whole body over, and thus covered it with mucus. It then began to swallow it at that end that offered least resistance; while its length of body was dilated to receive its prey, and thus took in at once a morsel that was three times its own thickness.—We are assured by travellers, that these animals are often found with the body of a stag in their gullet, while the horns, which they are unable to swallow, keep sticking out at their mouths.

But it is happy for mankind that the rapacity of these frightful creatures is often their punishment; for whenever any of the serpent kind have gorged themselves in this manner, whenever their body is seen particularly distended with food, they then become torpid, and may be approached and destroyed with safety. Patient of hunger to a surprising degree, whenever they seize and swallow their prey, they seem, like surfeited gluttons, unwieldy, stupid, helpless and sleepy: they at that time seek some retreat, where they may lurk for several days together, and digest their meal in safety: the smallest effort at that time is capable of destroying them; they can scarce make any resistance: and they are equally unqualified for flight or opposition: that is the happy opportunity of attacking them with success: at that time the naked Indian himself does not fear to assail them. But it is otherwise when this sleepy interval of digestion is over; they then issue, with famished appetites, from their retreats, and with accumulated terrors, while every animal of the forest flies before them.

Carli describes the Long Serpent of Congo, making its track through the tall grass like mowers in a summer's day. He could not without terror behold whole lines of grass lying levelled under the sweep of its tail. In this manner it moved forward with great rapidity, until it found a proper situation frequented by its prey: there it continued to lurk, in patient expectation, and would have remained for weeks together, had it not been disturbed by the natives.

Other creatures have a choice in their provision; but the serpent indiscriminately preys upon all; the buffalo, the tiger, and the gazelle. One would think that the porcupine's quills might be sufficient to protect it; but whatever has life, serves to appease the hunger of these devouring creatures: porcupines with all their quills have frequently been found in their stomachs, when killed and opened; nay, they most frequently are seen to devour each other.

A life of savage hostility in the forest, offers the imagination one of the most tremendous pictures in Nature. In those burning countries, where the sun dries up every brook for hundreds of miles round; when what had the appearance of a great river in the rainy season becomes in summer, one dreary bed of sand—in those countries, I say, a lake that is never dry, or a brook that is perennial, is considered by every animal as the greatest convenience of Nature. As to food, the luxuriant landscape supplies that in sufficient abundance: it is the want of water that all animals endeavour to remove; and, inwardly parched by the heat of the climate, traverse whole deserts to find out a spring. When they have discovered this, no dangers can deter them from attempting to slake their thirst. Thus, the neighbourhood of a rivulet, in the heart of the tropical continents, is generally the place where all the hostile tribes of Nature draw up for the engagement. On the banks of this little envied spot, thousands of animals of various kinds are seen venturing to quench their thirst, or preparing to seize their prey. The elephants are perceived, in a long line, marching from the darker parts of the forest; the buffaloes are there, depending upon numbers for security; the gaselles, relying solely upon their swiftness; the lion and tiger waiting a proper opportunity to seize; but chiefly the larger serpents are upon guard there, and defend the accesses of the lake. Not an hour passes without some dreadful combat; but the serpent, defended by its scales, and naturally capable of sustaining a multitude of wounds, is of all others, the most formidable. It is the most wakeful also; for the whole tribe sleep with their eyes open, and are consequently, for ever upon the watch: so that, till their rapacity is satisfied, few other animals will venture to approach their station.

But though these animals, are of all others, the most voracious, and though the morsel which they swallow without chewing, is greater than what any other creature, either by land or water, the whale itself, not excepted, can devour, yet no animals upon earth bear abstinence so long as they. A single meal, with many of the snake kind, seems to be the adventure of a season; it is an occurrence for which they have been for weeks, nay, sometimes for months in patient expectation of. When they have seized their prey, their industry for several weeks is entirely discontinued; the fortunate capture of an hour, often satisfies them for the remaining period of their annual activity. As their blood is colder than that of most other terrestrial animals, and as it circulates but slowly through their bodies, so their powers of digestion are but feeble. Their prey continues, for a long time, partly in the stomach, partly in the gullet, and a part is often seen hanging out of the mouth. In this manner, it digests by degrees; and in proportion as the part below is dissolved, the part above is taken in. It is not, therefore till this tedious operation is entirely performed that the serpent renews its appetite and its activity. But should any accident prevent it from issuing once more from its cell, it still can continue to bear famine, for weeks, months, nay, for years together. Vipers are often kept in boxes for six or eight months, without any food whatever; and there are little serpents sometimes sent over to Europe from Grand Cairo, the name of which I have not been able to learn, that live for several years in glasses, and never eat at all, nor even stain the glass with their excrements. Thus the serpent tribe unite in themselves two very opposite qualities; wonderful abstinence, and yet incredible rapacity.

If leaving the consideration of their appetites, we come to compare serpents as to their voices, some are found silent, some have a peculiar cry, but hissing is the sound which they most commonly send forth, either as a call to their kind, or as a threat to their enemies. In the countries where they abound, they are generally silent in the middle of the day, when they are obliged to retire from the heat of the climate; but as the cool of the evening approaches, they are then heard issuing from their cells, with continued hissings; and such is the variety of their notes that some have assured me they very much resemble the music of an English grove. This some will hardly credit—at any rate, such notes, however pleasing, can give but very little delight, when we call to mind the malignity of the minstrel. If considered, indeed, as they answer the animal's own occasions, they will be found well adapted to its nature, and fully answering the purposes of terrifying such as would venture to offend it.

With respect to motion, some serpents, particularly those of the viper kind, move slowly; while others, such as the Ammodytes, dart with amazing swiftness. The motion in all is similar; but the strength of body in some gives a very different appearance. The viper, that is but a slow, feeble bodied animal, makes way in a heavy, undulating manner; advancing his head, then drawing up its tail behind, and bending the body into a bow; then from the spot where the head and tail were united, advancing the head forward as before. This, which is the motion of all serpents, is very different from that of the earth-worm or the naked snail. The serpent, as was said above, has a back-bone with numerous joints, and this bone the animal has a power of bending in every direction, but without being able to shorten or lengthen it at pleasure. The earth-worm, on the other hand has no back-bone; but its body is composed of rings, which, like a barber's puff, it can lengthen or shorten as it finds necessary. The earth-worm, therefore, in order to move forward, lengthens the body; then, by the fore part clings to the ground, where it has reached, and then contracts and brings up its rear: then when the body is thus shortened, the fore part is lengthened again for another progression; and so on. The serpent instead of shortening the body, bends it into an arch; and this is the principal difference between serpentine and vermicular progression.

I have instanced this motion in the viper, as most easily discerned; but there are many serpents that dart with such amazing swiftness, that they appear rather to leap than crawl. It is most probable, however, that no serpent can dart upon even ground farther than its own length at one effort. Our fears, indeed, may increase the force of their speed, which is sometimes found so fatal. We are told by some, that they will dart to a very great distance; but this my inquiries have never been able to ascertain. The manner of progression in the swiftest serpent we know, which is the jaculus, is by instantly coiling itself upon its tail, and darting from thence to its full extent; then carrying the tail, as quick as lightning, to the head, coiling and darting again: and, by this means proceeding, with extreme rapidity, without ever quitting the ground. Indeed, if we consider the length and the weakness of the back-bone in all these animals; if we regard the make of their vertebræ, in which we shall find the junctures all formed to give play and none to give power; we cannot be of opinion that they have a faculty of springing from the ground, as they entirely want a *fulcrum*, if I may so express it, from whence to take their spring; the whole body being composed of unsupported muscles and joints that are yielding. It must be confessed that they dart down from trees upon their prey; but their weight alone is sufficient for that purpose, without much effort of their own.

Though all serpents are amphibious, some are much fonder of the water than others; and, though destitute of fins or gills, remain at the bottom, or swim along the surface with great ease. From their internal structure, just sketched above, we see how well adapted they are for either element; and how capable their blood is of circulating at the bottom, as freely as in the frog or the tortoise. They can, however, endure to live in fresh-water only; for salt is an effectual bane to the whole tribe. The greatest serpents are most usually found in fresh-water, either choosing it as their favourite element, or finding their prey in such places in the greatest abundance. But that all will live and swim in liquids, appears from the experiment of Rhedi; who put a serpent into a large glass vessel of wine, where it lived swimming about six hours; though, when it was by force immersed and kept under that liquid, it lived only one hour and a half. He put another in common water, where it lived three days; but when it was kept under water, it lived only about twelve hours.* Their motion there, however, is perfectly the reverse of what it is upon land; for, in order to support themselves upon an element lighter than their bodies, they are obliged to increase their surface, in a very artificial manner. On earth their windings are perpendicular to the surface; in water they are parallel to it; in other words if I should wave my hand up and down, it will give an idea of the animal's progress on land; if I should wave it to the right and left, it will give some idea of its progress on the water.

Some serpents have a most horrible fœtor attending them, which is alone capable of intimidating the brave. This proceeds from two glands near the vent, like those in the weasel or polecat; and like those animals, in proportion as they are excited by rage or by fear, the scent grows stronger. It would seem, however, that such serpents as are most venomous, are least offensive in this particular; since the rattle-snake and the viper have no smell whatever: Nay, we are told that at Calicut and Cranganon, in the East Indies, there are some very noxious serpents, who are so far from being disagreeable, that their excrements are sought after and kept as the most pleasing perfume. The Esculapian Serpent is also of this number.

Some serpents bring forth their young alive, as the viper; some bring forth eggs, which are hatched by the heat of their situation; as the common black snake, and a majority of the serpent tribe. When a reader, ignorant of anatomy is told, that some of those animals produce their young alive, and that some produce eggs only, he is apt to suppose a very great difference in the internal conformation, which makes such a variety in the manner of bringing forth. But this is not the case: these animals are internally alike, in whatever manner they produce their young; and the variety in their bringing forth, is rather a slight than a real discrimination. The only difference is, that the viper hatches her eggs and brings them to maturity within her body; the snake is more premature in her productions, and sends her eggs into the light, some time before the young ones are capable of leaving the shell. Thus, if either are opened, the eggs will be found in the womb, covered with their membranous shell, and adhering to each other, like large beads on a string. In the eggs of both, young ones will be found, though at different stages of maturity: those of the viper will crawl and bite the moment the shell that encloses them is broke open; those of the snake are not yet arrived at their perfect form.

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* Rhedi, Exper. p. 170.

Father Labat took a serpent of the viper kind that was nine feet long, and ordered it to be opened in his presence. He then saw the manner in which the eggs of these animals lie in the womb. In this creature there were six eggs, each of the size of a goose egg, but longer, more pointed, and covered with a membranous skin, by which also they were united to each other. Each of these eggs contained from thirteen to fifteen young ones, about six inches long, and as thick as a goose quill. Though the female from whence they were taken was spotted, the young seemed to have a variety of colours very different from the parent; and this led the traveller to suppose that the colour was no characteristic mark among serpents. These little mischievous animals were no sooner let loose from the shell, than they crept about, and put themselves into a threatening posture, coiling themselves up, and biting the stick with which he was destroying them. In this manner he killed seventy-four young ones; those that were contained in one of the eggs escaped at the place where the female was killed, by the bursting of the egg, and their getting among the bushes.

The last distinction that I shall mention, but the most material among serpents, is that some are venomous, and some inoffensive. If we consider the poison of serpents as it relates to man, there is no doubt but that it is a scourge and an affliction. The various calamities that the poison of serpents is capable of producing, are not only inflicted by the animal itself, but by men more mischievous than even serpents, who prepare their venom to destroy each other. With this the savages poison their arms, and also prepare their revengeful potions. The ancients were known to preserve it for the purposes of suicide; and even among semi-barbarous countries to this day, the venom of snakes is used as a philtre.

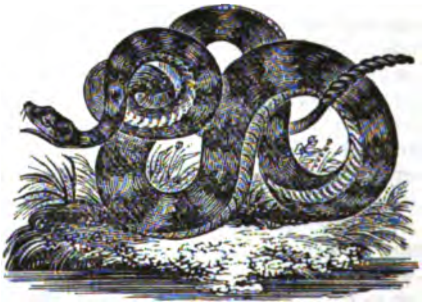
But, though the poison be justly terrible to us, it has been given to very good purposes for the animal's own proper support and defence. Without this, serpents, of all other animals, would be most exposed and defenceless: without feet for escaping a pursuit: without teeth capable of inflicting a dangerous wound, or without strength for resistance; incapable, from their size, of finding security in very small retreats, like the earth-worm, and disgusting all from their deformity, nothing was left for them but a speedy extirpation. But furnished as they are with powerful poison, every rank of animals approach them with dread, and never seize them but at an advantage. Nor is this all the advantage they derive from it. The malignity of a few serves for the protection of all. Though not above a tenth of their number are actually venomous, yet the similitude they all bear to each other excites a general terror of the whole tribe; and the uncertainty of their enemies in which the poison chiefly resides, makes even the most harmless formidable. Thus Providence seems to have acted with double precaution; it has given some of them poison for the general defence of a tribe naturally feeble; but it has thinned the numbers of those which are venomous, lest they should become too powerful for the rest of Animated Nature.

From these noxious qualities of the serpent kind, it is no wonder that not only man, but beasts and birds carry on an unceasing war against them. The ichneumon of the Indies, and the peccary of America, destroy them in great numbers. These animals have the art of seizing them near the head; and it is said they can skin them with great dexterity. The vulture and the eagle also prey upon them in great abundance; and often sousing down from the clouds, drop upon a long serpent, which they snatch up struggling and writhing in the air. Dogs also are bred up to oppose them. Father Feuillée tells us, that being in the woods of Martinico, he was attacked by a large serpent, which he could not easily avoid, when his dog immediately came to his relief, and seized the assailant with great courage. The serpent entwined him, and pressed him so violently, that the blood came out of his mouth, and yet the dog never ceased till he had torn it to pieces. The dog was not sensible of his wounds during the fight; but soon after his head swelled prodigiously, and he lay on the ground as dead. But his master having found hard by a banana tree, he applied its juice, mixed with treacle to the wounds, which recovered the dog, and quickly healed his sores.

But it is in man that these venomous creatures find the most dangerous enemy. The Psylli of old were famous for charming and destroying serpents. Some moderns pretend to the same art. Cassaubon says, that he knew a man who could at any time summon a hundred serpents together, and draw them into the fire. Upon a certain occasion, when one of them bigger than the rest would not be brought in, he only repeated his charm, and it came forward, like the rest, to submit to the flames. Philostratus describes particularly how the Indians charm serpents. "They take a scarlet robe, embroidered with golden letters, and spread it before a serpent's hole. The golden letters have a fascinating power; and by looking stedfastly, the serpent's eyes are overcome and laid asleep." These, and many other feats, have been often practised upon these animals by artful men, who had first prepared the serpents for their exercise, and then exhibited them as adventitiously assembled at their call. In India there is nothing so common as dancing serpents, which are carried about in a broad flat vessel, somewhat resembling a sieve. These erect and put themselves in motion at the word of command. When their keeper sings a slow tune, they seem by their heads to keep time; when he sings a quicker measure, they appear to move more brisk and lively. All animals have a certain degree of docility; and we find that serpents themselves can be brought to move and approach at the voice of their master. From this trick, successfully practised before the ignorant, it is most probable has arisen all the boasted pretensions which some have made to charming of serpents; an art to which the native Americans pretend at this very day. One of Linnæus's pupils, we are told, purchased the secret from an Indian, and then discovered it to his master; but, like all secrets of the kind, it is probable this ended in a few unmeaning words of no efficacy.

Though the generality of mankind regard this formidable race with horror, yet there have been some nations, and there are some at this day that consider them with veneration and regard. The adoration paid by the ancient Egyptians to a serpent is well known: many of the nations at present along the western coast of Africa retain the same unaccountable veneration. Upon the gold and slave coasts, a stranger, upon entering the cottages of the natives, is often surprised to see the roof swarming with serpents, that cling there without molesting and unmolested by the natives. But his surprise will increase upon going farther southward to the kingdom of Widah, when he finds that a serpent is the god of the country

Amphisbæna, or Blind Snake, p. 101.



Rattlesnake, p. 97.

Chameleon, p. 76.

To face p. 91, vol. iv

This animal, which travellers describe as a huge overgrown creature, has its habitation, its temple, and its priests. These impress the vulgar with an opinion of its virtues; and numbers are daily seen to offer not only their goods, their provisions, and their prayers, at the shrine of their hideous deity, but also their wives and daughters.—These the priests readily accept of, and after some days of penance, return them to their suppliants, much benefitted by the serpent's supposed embraces. Such a complicated picture of ignorance and imposture gives no very favourable impressions of our fellow creatures; but we may say in defence of Human Nature, that the most frightful of reptiles is worshipped by the most uncultivated and barbarous of mankind.

From this general picture of the serpent tribe, one great distinction obviously presents itself; namely, into those that are venomous, and those that are wholly destitute of poison. To the first belong the viper, the rattlesnake, the cobra di capello, and all their affinities: to the other, the common black snake, the liboya, the boiguacu, the amphisbæna, and various others, that, though destitute of venom, do not cease to be formidable. I will, therefore, give their history separately, beginning with the venomous class, as they have the strongest claims to our notice and attention.

CHAPTER II.

OF VENOMOUS SERPENTS IN GENERAL.

THE poison of serpents has been for ages one of the greatest objects of human consideration. To us, who seldom feel the vengeful wound, it is merely a subject of curiosity; but to those placed in the midst of the serpent tribe, who are every day exposed to some new disaster, it becomes a matter of the most serious importance. To remedy the bite of a serpent is considered among our physicians, as one of the slightest operations in medicine: but among the physicians of the East, the antidotes for this calamity make up the bulk of their dispensaries. In our colder climates, the venom does not appear with that instantaneous operation which it exhibits in the warmer regions; for either its powers are less exquisite, or our fluids are not carried round in such rapid circulation.

In all countries, however, the poison of the serpent is sufficiently formidable to deserve notice, and to excite our attention to its nature and effects. It will, therefore, in the first place be proper to describe its seat in the animal, as also the instrument by which the wound is made, and the poison injected. In all this venomous class of reptiles, whether the viper, the rattlesnake or the cobra di capello, there are two large teeth or fangs that issue from the upper jaw, and that hang out beyond the lower. The rest of the snake tribe are destitute of these; and it is most probable, that wherever these fangs are wanting, the animal is harmless; on the contrary, wherever they are found, it is to be avoided as the most pestilent enemy. These are the instruments that seem to place the true distinction between animals of the serpent kind; the wounds which these fangs inflict produce the most dangerous symptoms; the wounds inflicted by the teeth only are attended with nothing more than the ordinary consequences attending the bite of any other animal. Our first great attention, therefore, upon seeing a serpent, should be directed to the teeth. If it has the fang teeth, it is to be placed among the venomous class: if it wants them, it may be set down as inoffensive. I am not ignorant that many serpents are said to be dangerous whose jaws are unfurnished with fangs; but it is most probable that our terrors only have furnished these animals with venom; for of all the tribe whose teeth are thus formed, not one will be found to have a bag for containing poison, nor a conduit for injecting it into the wound. The Black Snake, the Liboya, the Blind Worm, and a hundred others that might be mentioned, have their teeth of an equal size, fixed into the jaws, and with no other apparatus for inflicting a dangerous wound than a dog or a lizard; but it is otherwise with the venomous tribe we are now describing; these are well furnished, not only with an elaboratory where the poison is formed, but a canal by which it is conducted to the jaw, a bag under the tooth for keeping it ready for every occasion, and also an aperture in the tooth itself for injecting it into the wound. To be more particular, the glands that serve to fabricate this venomous fluid are situated on each side of the head behind the eyes, and have their canals leading from thence to the bottom of the fangs in the upper jaw, where they empty into a kind of bladder, from whence the fangs on each side are seen to grow. The venom contained in this bladder is a yellowish thick tasteless liquor, which injected into the blood is death, yet which may be swallowed without any danger.

The fangs that give the wound come next under observation; they are large in proportion to the size of the animal that bears them; crooked, yet sharp enough to inflict a ready wound. They grow one on each side, and sometimes two, from two moveable bones in the upper jaw, which by sliding backward or forward, have a power of erecting or depressing the teeth at pleasure. In these bones are also fixed many teeth, but no way venomous, and only serving to take and hold the animal's prey. Besides this apt disposition of the fangs, they are hollow within, and have an opening towards the point like the slit of a pen, through which, when the fang is pressed down upon the bladder where it grows, there is seen to issue a part of the venom that lay below. To describe this operation at once, when the serpent is irritated to give a venomous wound, it opens its formidable jaws to the widest extent; the moveable bones of the upper jaw slide forward; the fangs that lay before inclining are thus erected; they are struck with force into the flesh of the obnoxious person; by meeting resistance at the points, they press upon the bladders of venom from whence they grow; the venom issues up through the hollow of the tooth, and is pressed out through its slit into the wound, which by this time the tooth has made in the skin. Thus from a slight puncture, and the infusion of a drop of venom scarce larger than the head of a pin, the part is quickly inflamed, and, without a proper antidote, the whole frame contaminated.

The appearances which this venom produces are different, according to the serpent that wounds, or the season, or the strength of the animal that strikes the blow. If a viper inflicts the wound, and the remedy be neglected, the symptoms are not without danger. It first causes an acute pain in the place affected, attended with a swelling, first red, and afterwards livid This by degrees spreads to the neighbouring parts; great faintness and a quick, though a low and interrupted pulse ensues: to this succeed great sickness at the stomach, bilious and convulsive vomitings, cold sweats, pains about the navel, and death itself. But the violence of the symptoms depends much on the season of the year, the difference of the climate, the size or rage of the animal, and the depth and situation of the wound. These symptoms are much more violent, and succeed each other more rapidly after the bite of a rattlesnake; but when the person is bit by the cobra di capello, he dies in an hour, his whole frame being dissolved into a putrid mass of corruption.

Nothing surely can more justly excite our wonder, than that so small a quantity of venom should produce such powerful and deadly effects. If the venom itself be examined through a microscope, it will be found to shoot into little crystals, that, to an imagination already impressed with its potency, look like so many darts fit for entering the blood-vessels, and wounding their tender coats. But all these darts are wholly of our own making; the softest mildest fluid whatever, possessed of any consistency, will form crystals under the eye of the microscope, and put on an appearance exactly like the venom of the viper. In fact this venom has no acrid taste whatever; and to all experiments that our senses can make upon it, appears a slimy insipid fluid. Charas, who often tasted it, assures us of the fact; and asserts, that it may be taken inwardly without any sensible effects, or any prejudice to the constitution. But the famous experiments that were tried by Rhedi and others, in the presence of the Great Duke of Tuscany and his court, put this beyond any doubt whatsoever. By these it appeared that the serpent having once bitten, exhausted for that time the greatest part of its poison; and though the wound caused by its biting a second time was attended with some malignant symptoms, yet they were much milder than before. It appeared that the serpent biting upon a sponge, or a piece of soft bread, and then biting a dog immediately after, did not inflict a wound more dangerous than the prick of a needle. It appeared that the venom being collected, and a needle dipped therein, this produced almost as painful effects as the tooth of the animal itself. But what caused the greatest surprise in the court was, the seeming rashness of one Tozzi, a viper-catcher; who, while the philosophers were giving elaborate lectures on the danger of poison when taken internally, boldly desired a large quantity of it might be put together; and then, with the utmost confidence, drank it off before them all. The court was struck with astonishment, and expected that the man would instantly fall dead; but they soon perceived their mistake, and found that taken in this manner the poison was as harmless as water; so true is that famous passage of Lucan

> Noxia serpentum est admixto sanguine pestis:
> Morsu virus habent, et fatum in dente minantur;
> Pocula morte carent.

What then shall we say to the speedy effect of so seemingly harmless a liquid taken into the circulation? Let us first observe, that milk is one of the most mild and nourishing of all fluids, and seemingly the most friendly to the human constitution; yet if milk be injected into a vein, it will quickly become fatal, and kill with more certain destruction than even the venom of the viper. From hence then we may infer, that the introducing not only the serpentine venom, but also a quantity of any other mixture, into the circulation, will be fatal; and that, consequently, serpents kill as well by the power of injecting the wound as by the potency of their poison. Some indeed may inject a more acrimonious mixture, and this may produce more speedy effects; but any mixture thus injected would be dangerous, and many would be fatal.

Ray gives us an instance of the potency of the serpent poison; which though it has all the air of a fable, I cannot help transcribing. "A gentleman who went over to the East Indies, while he was one day sitting among some friends, was accosted by an Indian juggler, who offered to show him some experiments respecting the venom of serpents; an exhibition usual enough in that country. Having first, therefore, produced a large serpent, he assured the company that it was harmless; and to convince them of what he said, he tied up his arm, as is usual with those who are going to be bled, and whipped the serpent till it was provoked to bite him. Having drawn in this manner about half a spoonful of blood from his arm, he put the congealed clot upon his thigh. He then took out a much smaller serpent which was no other than the cobra di capello; and having tied up its neck, he produced about half a drop of its venom, which he sprinkled on the clot of blood on his thigh, which instantly began to ferment and bubble, and soon changed colour from a red into a yellow."

This, he pretended, was caused by the extreme malignity of that animal's venom; however, I have no doubt that the whole is either a fable, or a trick of the Indian's; who, while he seemed to mix the serpent's venom, actually infused some stronger ingredient, some mineral acid, into the mass of blood, which was capable of working such a change. It cannot be supposed that any animal poison could act so powerfully upon the blood already drawn and coagulated; for a poison that could operate thus instantaneously upon cold blood, could not fail of soon destroying the animal itself.

Be this as it will, the effects of serpent-poison are too well known, though the manner of operation be not so clear. As none of this malignant tribe grow to a great size, the longest of them not exceeding nine feet, they seldom seek the combat with larger animals, or offend others till they are first offended. Did they exert their malignity in proportion to their power, they could easily drive the ranks of Nature before them; but they seem unconscious of their own superiority, and rather fly than offer to meet the meanest opposer. Their food chiefly consists of small prey, such as birds, moles, toads, and lizards; so that they never attack the more formidable animals that would seldom die unrevenged. They lurk therefore in the clefts of rocks, or among stony places; they twine round the branches of trees, or sun themselves in the long grass at the bottom.—There they only seek repose and safety. If some unwary traveller invades their retreats, their first effort is to fly; but when either pursued or accidentally trod upon, they then make a fierce and fatal resistance. For this purpose, they raise themselves according to their strength upon their tail, erect their head, seize the limb that presses them, the wound is given, and the head withdrawn in a moment. It is not therefore without reason, that the Asiatics, who live in regions where serpents greatly abound, wear boots and long clothes, which very well protect their lower parts from the accidental resentment of their reptile annoyers.

In the eastern and western Indies, the number of noxious serpents is various; in this country we are acquainted only with one. The viper is the only animal in Great Britain from whose bite we have any thing to fear. In the tropical climates, the rattlesnake, the whipsnake, and the cobra di capello, are the most formidable, though by no means the most common. From the general notoriety of these particular serpents, and the universal terror which they occasion, it would seem that few others are possessed of such powerful malignity.

Vipers are found in many parts of this island; but the dry, stony, and particularly the chalky counties, abound with them. This animal seldom grows to a greater length than two feet; though sometimes they are found above three. The ground colour of their bodies is a dirty yellow; that of the female is deeper. The back is marked the whole length with a series of rhomboid black spots; touching each other at the points; the sides with triangular ones, and the belly entirely black. It is chiefly distinguished from the common black snake by the colour, which in the latter is more beautifully mottled, as well by the head, which is thicker than the body; but particularly by the tail, which in the viper, though it ends in a point, does not run tapering to so great a length as in the other. When, therefore, other distinctions fail, the difference of the tail can be discerned at a single glance.

The viper differs from most other serpents in being much slower, as also in excluding its young completely formed, and bringing them forth alive. The kindness of Providence seems exerted, not only in diminishing the speed, but also the fertility, of this dangerous creature. They copulate in May, and are supposed to be about three months before they bring forth, and have seldom above eleven eggs at a time. These are of the size of a blackbird's egg, and chained together in the womb like a string of beads. Each egg contains from one to four young ones; so that the whole of a brood may amount to about twenty or thirty. They continue in the womb till they come to such perfection as to be able to burst from the shell; and they are said by their own efforts to creep from the confinement into the open air, where they continue for several days without taking any food whatsoever. "We have been often assured," says Mr. Pennant, "by intelligent people, of the truth of a fact, that the young of the viper, when terrified, will run down the throat of the parent, and seek shelter in its belly in the same manner as the young of the opossum retire into the ventral pouch of the old one. From this," continues he, "some have imagined that the viper is so unnatural as to devour its own young; but this deserves no credit, as these animals live upon frogs, toads, lizards, and young birds, which they often swallow whole, though the morsel is often three times as thick as their own body."

The viper is capable of supporting very long abstinence, it being well known that some have been kept in a box six months without food; yet during the whole time they did not abate of their vivacity. They feed only a small part of the year, but never during their confinement; for if mice, their favourite diet, should at any time be thrown into their box, though they will kill, yet they will never eat them. When at liberty, they remain torpid throughout the winter; yet when confined, have never been ob served to take their annual repose. Their poison, however, decreases in proportion to the length of their confinement; and it is thought that the virtues of the animal's flesh are, by the same restraints, considerably lessened.

They are usually taken with wooden tongs, by the end of the tail, which may be done without danger: for, while held in that position, they are unable to wind themselves up to hurt their enemy: yet, notwithstanding this precaution, the viper-catchers are frequently bit by them; but, by the application of olive-oil, the bite is effectually cured.

One William Oliver, a viper-catcher at Bath, was the first who discovered this admirable remedy. On the first of June, 1735, in the presence of a great number of persons, he suffered himself to be bit by an old black viper, (brought by one of the company) upon the wrist and joint of the thumb on the right hand, so that drops of blood came out of the wound: he immediately felt a violent pain both at the top of his thumb, and up his arm, even before the viper was loosened from his hand; soon after he felt a pain, resembling that of burning, tickle up his arm; in a few minutes his eyes began to look red and fiery, and to water much; in less than an hour he perceived the venom seize his heart, with a pricking pain, which was attended with faintness, shortness of breath, and cold sweats; in a few minutes after this, his belly began to swell, with great gripings, and pains in his back, which were attended with vomitings and purgings: during the violence of these symptoms, his sight was gone for several minutes, but he could hear all the while. He said, that in his former experiments he had never deferred making use of his remedy longer than he perceived the effects of the venom reaching his heart; but this time, being willing to satisfy the company thoroughly, and trusting to the speedy effects of his remedy, which was nothing more than olive-oil, he forebore to apply any thing until he found himself exceeding ill and quite giddy. About an hour and a quarter after the first of his being bit, a chafing dish of glowing charcoal was brought in and his naked arm was held over it, as near as he could bear, while his wife rubbed in the oil with her hand, turning his arm continually round, as if she would have roasted it over the coals: he said the poison soon abated, but the swelling did not diminish much. Most violent purgings and vomitings soon ensued; and his pulse became so low and so often interrupted, that it was thought proper to order him a repetition of cordial potions: he said he was not sensible of any great relief from these; but that a glass or two of olive-oil drank down, seemed to give him ease. Continuing in this dangerous condition, he was put to bed, where his arm was again bathed over a pan of charcoal, and rubbed with olive-oil, heated in a ladle over the charcoal, by Dr. Mortimer's direction, who was the physician that drew up the account. From this last operation he declared that he found immediate ease, as though by some charm: he soon after fell into a profound sleep, and, after about nine hours sound rest, awaked about six the next morning, and found himself very well; but in the afternoon, on drinking some rum and strong beer, so as to be almost intoxicated, the swelling returned, with much pain and cold sweats, which abated soon, on bathing the arm, as before, and wrapping it up in brown paper soaked in the oil.

Such are the effects of the viper's bite; yet its flesh has long been celebrated as a noble medicine. A broth, made by boiling one viper in a quart of water till it comes to a pint, is the usual method in which it is given at present; and it is said to be a very powerful restorative in battered constitutions: the salt of vipers is also thought to exceed any other animal salt whatever, in giving vigour to the languid circulation, and promoting to venery.

The Rattlesnake is bred in America, and in no part of the old world. Some are as thick as a man's leg, and six feet in length; but the most usual size is from four to five feet long. In most particulars it resembles the viper: like that animal, having a large head and a small neck, being of a dusky colour, and furnished with fangs that inflict the most terrible wounds. It differs, however, in having a large scale, which hangs like a penthouse over each eye. The eye also is furnished with a nictitating membrane, that preserves it from dust; and its scales are of a considerable degree of hardness. They are of an orange, tawny, and blackish colour on the back; and of an ash-colour on the belly, inclining to lead. The male may be readily distinguished from the female, by a black velvet spot on the head, and by the head being smaller and longer. But that which, besides their superior malignity, distinguishes them from all other animals, is their rattle, an instrument lodged in their tail, by which they make such a loud, rattling noise, when they move, that their approach may readily be perceived, and the danger avoided. This rattle which is placed in the tail, somewhat resembles, when taken out of the body, the curb chain of a bridle: it is composed of several thin, hard, hollow bones, linked to each other, and rattling upon the slightest motion. It is supposed by some, that the snake acquires an additional bone every year; that, from hence, its age may be precisely known: however this may be, certain it is, that the young snakes of a year or two old, have no rattles at all; while many old ones have been killed, that had from eleven to thirteen joints each. They shake and make a noise with these rattles with prodigious quickness when they are disturbed: however the peccary and the vulture are no way terrified at the sound, but hasten, at the signal, to seize the snake, as their most favourite prey.

It is very different with almost every other animal. The certain death which ensues from this terrible creature's bite, makes a solitude wherever it is heard. It moves along with the most majestic rapidity; neither seeking to offend the larger animals, nor fearing their insults. If unprovoked, it never meddles with any thing but its natural prey; but when accidentally trod upon, or pursued to be destroyed, it then makes a dreadful and desperate defence. It erects itself upon its tail, throws back the head and inflicts its wound in a moment; then parts, and inflicts a second wound: after which, we are told, by some, that it remains torpid and inactive without even attempting to escape.

The very instant the wound is inflicted, though small in itself, it appears more painful than the sting of a bee. This pain which is so suddenly felt, far from abating, grows every moment more excruciating and dangerous: the limb swells; the venom reaches the head, which is soon of a monstrous size; the eyes are red and fiery; the heart beats quick, with frequent interruptions: the pain becomes insupportable, and some expire under it in five or six hours; but others, who are of stronger constitutions, survive the agony for a few hours longer, only to sink under a general mortification, which ensues, and corrupts the whole body.

As a gentleman in Virginia was walking in the fields for his amusement, he accidentally trod upon a rattlesnake, that had been lurking in a stony place; which, enraged by the pressure, reared up, bit his hand, and shook his rattles. The gentleman readily perceived that he was in the most dreadful danger; but unwilling to die unrevenged, he killed the snake, and carrying it home in his hand, threw it on the ground before his family crying out, "I am killed and there is my murderer!" In such an extremity, the speediest remedies were the best. His arm, which was beginning to swell, was tied up near the shoulder, the wound was anointed with oil, and every precaution taken to stop the infection. By the help of a very strong constitution he recovered; but not without feeling the most varirious and dreadful symptoms for several weeks together. His arm, below the ligature, appeared of several colours, with a writhing among the muscles, that to his terrified imagination, appeared like the motions of the animal that had wounded him. A fever ensued; the loss of his hair, giddiness, drought, weakness, and nervous faintings: till by slow degrees, a very strong habit overpowered the latent malignity of the poison.

Several remedies have been tried to alleviate this calamity. A decoction of the Virginian snake-root is considered as the most effectual; and at the same time the head of the animal bruised and laid upon the part affected, is thought to assist the cure. In general, however, it is found to be fatal; and the Indians, sensible of this, take care to dip their arrows in the poison under the rattlesnake's fangs, when they desire to take a signal revenge of their enemies.

Thus much concerning this animal is agreed upon by every naturalist: there are other circumstances in its history, which are not so well ascertained. And first, its motion, which some describe as the swiftest imaginable; asserting that its Indian name of *Ecacoalt*, which signifies the wind-serpent, implies its agility: others, on the contrary, assert that it is the slowest and the most sluggish of all serpents; and that it seldom moves from one place. In this opposition of opinions, there are others, who assert, that on even ground it moves but slowly; but then, among rocks, that it goes at a great rate. If we may argue from analogy, the opinion of those who contend for its slow motion, seems the most probable; as the viper, which it so very much resembles, is remarkable among serpents for its inactivity.

It is said also by some, that the rattlesnake has a power of charming its prey into its mouth; and this is as strongly contradicted by others. The inhabitants of Pennsylvania are said to have opportunities of observing this strange fascination every day. The snake is often seen basking at the foot of a tree, where birds and squirrels make their residence. There, coiled upon its tail, its jaws extended, and its eyes shining like fire, the rattlesnake levels its dreadful glare upon one of the little animals above. The bird, or the squirrel, which ever it may be, too plainly perceives the mischief meditating against it, and hops from branch to branch, with a timorous, plaintive sound, wishing to avoid, yet incapable of breaking through the fascination: thus it continues for some time its feeble efforts and complaints, but is still seen approaching lower and lower towards the bottom branches of the tree, until at last, as if overcome by the potency of its fears, it jumps down from the tree directly into the throat of its frightful destroyer.

In order to ascertain the truth of this story, a mouse was put into a large iron cage, where a rattlesnake was kept, and the effect carefully observed. The mouse remained motionless at one end of the cage; while the snake at the other, continued fixed, with its eye glaring full on the little animal, and its jaws opened to their widest extent: the mouse for some time seemed eager to escape; but every effort served only to increase its terrors, and to draw it still nearer the enemy; till, after several ineffectual attempts to break the fascination, it was seen to run into the jaws of the rattlesnake, where it was instantly killed.

To these accounts the incredulous oppose the improbability of the fact: they assert, that such a power ascribed to serpents, is only the remnant of a vulgar error, by which it was supposed that serpents could be charmed, and had also a power of charming. They aver, that animals are so far from running down the throat of a rattlesnake in captivity, that the snake will eat nothing in that state, but actually dies for want of subsistence.

A serpent, called the Whipsnake, is still more venomous than the fo mer. This animal, which is a native of the east, is about five feet long yet not much thicker than the thong of a coachman's whip. It is exce ingly venomous; and its bite is said to kill in about six hours. One o the Jesuit missionaries, happening to enter into an Indian pagoda, saw what he took to be a whipcorp lying on the floor, and stooped to take it up; but, upon handling it, what was his surprise to find that it was animated, and no other than the whipsnake, of which he had heard such formidable accounts: fortune, however, seemed favourable to him, for he grasped it by the head, so that it had no power to bite him, and only twisted its folds up his arm. In this manner he held it, till it was killed by those who came to his assistance.

To this formidable class might be added the Asp, whose bite however is not attended with those drowsy symptoms which the ancients ascribed to it. The Jaculus of Jamaica also, is one of the swiftest of the serpent kind. The Hæmorrhois, so called from the *hæmorrhages* which its bite is said to produce; the Seps whose wound is very venomous and causes the part affected to corrupt in a very short time; the Coral Serpent, which is red, and whose bite is said to be fatal. But of all others the Cobra di Capello, or Hooded Serpent, inflicts the most deadly and incurable wounds. Of this formidable creature there are five or six different kinds; but they are all equally dangerous, and their bite followed by speedy and certain death. It is from three to eight feet long, with two large fangs hanging out of the upper jaw. It has a broad neck, and a mark of dark brown on the forehead; which when viewed frontwise, looks like a pair of spectacles; but behind like the head of a cat. The eyes are fierce and full of fire; the head is small and the nose flat, though covered with very large scales of a yellowish ash-colour; the skin is white, and the large tumour on the neck is flat, and covered with oblong, smooth scales. The bite of this anima is said to be incurable, the patient dying in about an hour after the wound; the whole frame being dissolved into one putrid mass of corruption.

To remedy the bite of all these animals, perhaps salad-oil would be very efficacious: however, the Indians make use of a composition, which is called, in Europe, *Petro di Cobra*, or the *Serpent-stone*; and which applied to the wound is said to draw out the venom. The composition of this stone, for it is an artificial substance, is kept a secret; and pe haps its effects in extricating the venom may be imaginary: nevertheless, it is certain that it has a power of sticking to the skin, and sucking a part of the blood from the wound. This it may do somewhat in the same manner as we see a tobacco-pipe stick to the lips of a man who is smoking: yet still we are ignorant of the manner; and the secret might probably be of some use in medicine. It were to be wished therefore, that those who go into India would examine into this composition, and give us the result of their enquiries: but I fear that it is not to benefit mankind, that our travellers now go to India.

CHAPTER III.

OF SERPENTS WITHOUT VENOM.

THE class of serpents without poison, may be distinguished from those that are venomous, by their wanting the fang-teeth: their heads, also, are not so thick in proportion to their bodies; and, in general, they taper off to the tail more gradually in a point. But notwithstanding their being destitute of venom they do not cease to be formidable: some grow to a size by which they become the most powerful animals of the forest; and even the smallest and most harmless of this slender tribe, find protection from the similitude of their form.

The fangs make the great distinction among serpents; and all this tribe are without them. Their teeth are short, numerous, and, in the smaller kinds perfectly inoffensive: they lie in either jaw, as in frogs and fishes, their points bending backwards, the better to secure their prey They want that artificial mechanism by which the poisonous tribe inflict such deadly wounds: they have no gland in the head for preparing venom; no conduits for conveying it to the teeth; no receptacles there; no hollow in the instrument that inflicts the wound. Their bite, when the teeth happen to be large enough to penetrate the skin, (for in general, they are too small for this purpose) is attended with no other symptoms than those of an ordinary puncture; and many of this tribe, as if sensible of their own impotence, cannot be provoked to bite, though ever so rudely assaulted.—They hiss, dart out their forky tongues, erect themselves on the tail, and call up all their terrors to intimidate their aggressors; but seem to consider their teeth as unnecessary instruments of defence, and never attempt to use them. Even amongst the largest of this kind, the teeth are never employed in the most desperate engagements. When a hare or a bird is caught, the teeth may serve to prevent such small game from escaping, but when a buffalo or a tiger is to be encountered, it is by the strong folds of the body, by the fierce verberations of the tail, that the enemy is destroyed: by thus twining round, and drawing the knot with convulsive energy, this enormous reptile breaks every bone in the quadruped's body, and then at one morsel, devours its prey.

From hence we may distinguish the unvenomous tribe into two kinds first into those which are seldom found of any considerable magnitude, and that never offend animals larger or more powerful than themselves, but which find their chief protection in flight, or in the doubtfulness of their form; secondly, into such as grow to an enormous size, fear no enemy, but indiscriminately attack all other animals and devour them. Of the first kind is the Common Black Snake, the Blind Worm, the Esculapian Serpent, the Amphisbæna, and several others. Of the second, the Liboya, the Boiguacu, the Depona, and the Boiquatrara.

The black snake is the largest of English serpents, sometimes exceeding four feet in length. The neck is slender; the middle of the body thick; the back and sides covered with small scales; the belly with oblong, narrow, transverse plaits: the colour of the back and sides are of a dusky brown; the middle of the back marked with two rows of small black spots, running from the head to the tail; the plaits on the belly are dusky: the scales on the sides are of a bluish white; the teeth are small and serrated, lying on each side of the jaw in two rows. The whole species is perfectly inoffensive; taking shelter in dunghills, and among bushes in moist places; from whence they seldom remove, unless in the midst of the day, in summer, when they are called out by the heat to bask themselves in the sun. If disturbed or attacked they move away among the brambles with great swiftness; but if too closely pursued, they hiss and threaten, and thus render themselves formidable, though incapable of offending.

The black snake preys upon frogs, insects, worms, mice, and young birds: and considering the smallness of the neck, it is amazing how large an animal it will swallow. The black snake of Virginia, which is larger than ours, and generally grows to six feet long, takes a prey proportionable to its size; partridges, chickens, and young ducks. It is generally found in the neighbourhood of the hen-roost and will devour the eggs even while the hen is sitting upon them: these it swallows whole, and often after it has done the mischief will coil itself round in the nest.

The whole of this tribe are oviparous, excluding eighty or a hundred eggs at a time, which are laid in dunghills or hotbeds; the heat of which, aided by that of the sun, brings them to maturity. During winter they lie torpid, in banks of hedges, and under old trees.

The Blind Worm, is another harmless reptile, with a formidable appearance. The usual length of this species is eleven inches. The eyes are red; the head small; the neck still more slender; from that part the body grows suddenly, and continues of an equal bulk to the tail, which ends quite blunt: the colour of the back is cinereous, marked with very small lines, composed of minute black specks; the sides are of a reddish cast; the belly dusky, and marked like the back. The motion of this serpent is slow; from which, and from the smallness of the eyes, are derived its names; some calling it the slow, and some the blind worm. Like all the rest of the kind in our climates, they lie torpid during winter; and are sometimes found in vast numbers, twisted together. This animal, like the former, is perfectly innocent; however, like the viper it brings forth its young alive. Gesner tells us, that one of these being struck on the head when it was pregnant, it immediately cast forth its young.

The Amphisbæna, or the Double Headed Serpent, is remarkable for moving along with either the head or the tail foremost; and from thence it has been thought to have two heads. This error took its rise from the thickness of the tail, which, at a distance may be mistaken for another head. Upon a nearer view, however, the error is easily discovered, and the animal will be found formed according to the usual course of Nature. It is as thick at one end as at the other: and the colour of the skin is like that of the earth, being rough, hard, and variously spotted. Some have affirmed that its bite is dangerous; but this must be a mistake, as it wants the fangs, and, consequently, the elaboratory that prepares the poison.

These animals are only formidable from their similitude to the viper tribe; and in some countries, where such reptiles are common, they make the distinction so exactly, that while they destroy serpents of one kind with great animosity, they take others into their houses, and even into their bosoms, with a kind of unaccountable affection. The Esculapian Serpent of Italy is among this number. It is there suffered to crawl about the chambers; and often gets into the beds where people lie. It is a yellow serpent, of about an ell long; and, though innocent, yet will bite when exasperated. They are said to be great destroyers of mice; and this may be the reason why they are taken under human protection. The Boyuna of Ceylon is equally a favourite among the natives; and they consider the meeting it as a sign of good luck. The Surinam Serpent, which some improperly call the Ammodytes, is equally harmless and desirable among the savages of that part of the world. They consider themselves as extremely happy if this animal come into their huts. The colours of this serpent are so many and beautiful, that they surpass all description; and these perhaps are the chief inducements to the savages to consider its visits as so very fortunate. A still greater favourite is the Prince of Serpents, a native of Japan, that has not its equal for beauty. The scales which cover the back are reddish, finely shaded, and marbled with large spots of irregular figures mixed with black. The fore part of the head is covered with large beautiful scales, the jaws bordered with yellow, the forehead marked with a black marbled streak and the eyes handsome and lively. But of all others, the Gerenda of the East Indies is the most honoured and esteemed. To this animal, which is finely spotted with various colours, the natives of Calicut pay divine honours; and while their deity lies coiled up, which is its usual posture, the people fall upon their faces before it with stupid adoration. The African Gerenda is larger, and worshipped in the same manner by the inhabitants of the coast of Mozambique. The skin is not so finely spotted as the former; but it is variegated all over the body, with very fine, white, ash-coloured, and black spots. The brilliancy of colouring in these reptiles would only serve with us to increase our disgust; but in those countries where they are, common distinctions are made; and even in this horrid class, there are some eyes that can discover beauty.

But in the larger tribe of serpents, there is nothing but danger to be apprehended. This formidable class, though without venom, have something frightful in their colour, as well as their size and form. They want that vivid hue with which the savages are so much pleased in the lesser kinds; they are all found of a dusky colour, with large teeth, which are more formidable than dangerous.

The first of this class is the Great Liboya of Java and Brazil, which Legaut affirms he has seen fifty feet long. Nor is he singular in this report, as many of the missionaries affirm the same; and we have the concurrent testimony of historians as a further proof. The largest animal of this kind which has been brought into Europe, is but thirty-six feet long;

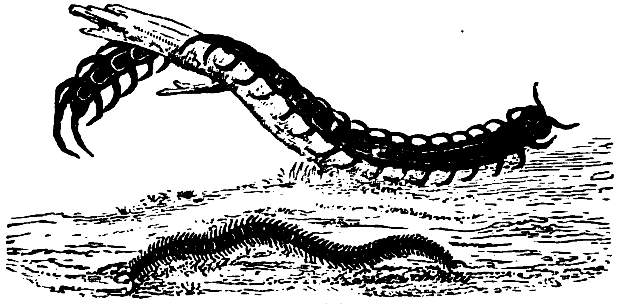
and it is probable, that much greater have been seen and destroyed, before they were thought worth sending so far to satisfy European curiosity. The most usual length, however, of the liboya, is about twenty feet, and the thickness in proportion. The teeth are small in proportion to the body; nor are they used, but when it seizes the smallest prey. It lies in wait for wild animals near the paths, and when it throws itself upon them, it wraps them round so closely as to break all the bones; then moistening the whole body over with its slaver, it makes it fit for deglutition, and swallows it whole.

The Boiguacu is supposed to be the next in magnitude, and has often been seen to swallow a goat whole. It is thickest in the middle of the body, and grows shorter and smaller towards the head and the tail: on the middle of the back, there is a chain of small black spots running along the length of it; and on each side, there are large, round, black spots, at some distance from each other, which are white in the centre: between these, near the belly, there are two rows of lesser black spots, which run parallel to the back. It has a double row of sharp teeth in each jaw, of a white colour and shining like mother of pearl. The head is broad; over the eyes it is raised into two prominences: near the extremity of the tail there are two claws, resembling those of birds.

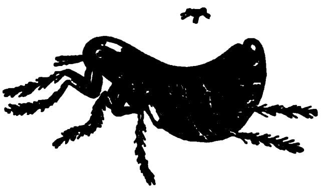
These serpents lie hid in thickets, from whence they sally out unawares, and raising themselves upright on their tails, will attack both men and beasts. They make a loud hissing noise when exasperated; and sometimes winding up trees, will dart down upon travellers, and twist them selves so closely round their bodies, as to despatch them in a very few minutes. Condamine, however, affirms that their bite is not dangerous; for though their teeth are so large as to inspire the beholder with terror, yet the wound they make is attended with no dangerous consequences whatever. Dellon affirms, that they generally haunt desert places; and though they are sometimes seen near great towns, or on the banks of rivers, yet it is generally after some great inundation: he never saw any but what were dead; and they appeared to him like the trunk of a great tree lying on the ground.

To this class of large serpents, we may refer the Depona, a native of Mexico, with a very large head and great jaws. The mouth is armed with cutting, crooked teeth, among which there are two longer than the rest, placed in the fore part of the upper jaw, but very different from the fangs of the viper. All around the mouth there is a broad scaly border; and the eyes are so large, that they give it a very terrible aspect. The forehead is covered with very large scales; on which are placed others, that are smaller, curiously ranged: those on the back are grayish, and along it runs a double chain, whose ends are joined in the manner of a buckler. Each side of the belly is marbled with large square spots, of a chesnut colour, in the middle of which is a spot, which is round and yellow.—They avoid the sight of man; and, consequently, never do much harm.

Such are the most noted animals of the serpent tribe; but to recount all, would be a vain, as well as a useless endeavour. In those countries where they abound, their discriminations are so numerous, and their colours so various, that every thicket seems to produce a new animal. The same serpent is often found to bring forth animals of eight or ten different colours; and the naturalist who attempts to arrange them by that mark, will find that he has made distinctions which are entirely disowned by Nature: however, a very considerable number might be added to enlarge the catalogue; but having supplied a general history, the mind turns away from a subject whereevery object presents something formidable or loathsome to the imagination. Indeed, the whole tribe resemble each other so nearly, that the history of one may almost serve for every other. They are all terrible to the imagination, all frightful to behold in their fury, and have long been considered as a race of animals between whom and man there is a natural antipathy.



Centipede, p. 129.
Millipede, p. 129.



Flea, p. 110.

Scorpion, p. 124.

Garden Spider p. 110.

Tarantula, p. 118.

To face p. 105, vol. iv

PART VI.

OF INSECTS.

BOOK I.

INSECTS OF THE FIRST ORDER

CHAPTER I.

OF INSECTS IN GENERAL

HAVING gone through the upper ranks of Nature, we descend to that of insects, a subject almost inexhaustible from the number of its tribes and the variety of their appearance. Those who have professedly written on this subject seem to consider it as one of the greatest that can occupy the human mind, as the most pleasing in Animated Nature.—" After an attentive examination," says Swammerdam, " of the nature and anatomy of the smallest as well as the largest animals, I cannot help allowing the least an equal or perhaps a superior degree of dignity. If, while we dissect with care the larger animals, we are filled with wonder at the elegant disposition of their parts, to what a height is our astonishment raised, when we discover all these parts arranged in the least in the same regular manner! Notwithstanding the smallness of ants, nothing hinders our preferring them to the largest animals. If we consider either their unwearied diligence, their wonderful strength, or their inimitable propensity to labour. Their amazing love to their young is still more unparalleled among the larger classes. They not only daily carry them to such places as may afford them food; but if by accident they are killed, and even cut into pieces, they with the utmost tenderness, will carry them away piecemeal in their arms. Who can show such an example among the larger animals which are dignified with the title of perfect? Who can find an instance in any other creature that can come in competition with this?

Such is the language of a man, who by long study, became enamoured of his subject; but to those who judge less partially, it will be found that the insect tribe, for every reason, deserve but the last and lowest rank in Animated Nature. As in mechanics the most complicated machines are required to perform the nicest operations, so in anatomy the noblest animals are most variously and wonderfully made.—Of all living beings man offers the most wonderful variety in his internal conformation; quadrupeds come next, and other animals follow in proportion to their powers or their excellencies. Insects seem of all others the most imperfectly formed: from their minuteness, the dissecting knife can go but a short way in the investigation; but one thing argues an evident imperfection, which is, that many of them can live a long time, though deprived of those organs which are necessary to life, in the higher ranks of Nature. Many of them are furnished with lungs and a heart, like nobler animals; yet the caterpillar continues to live, though its heart and lungs, which is often the case, are entirely eaten away.

But it is not from their conformation alone that insects are inferior to other animals, but from their instincts also. It is true that the ant and the bee present us with very striking instances of assiduity; but how far are theirs beneath the marks of sagacity exhibited in the hound or the stag! a bee, taken from the swarm, is totally helpless and inactive, incapable of giving the smallest vibration to its instincts; it has but one single method of operating, and, if put from that, it can turn to no other. In the pursuits of the hound, there is something like a choice; in the labours of the bee, the whole appears like necessity or compulsion.

If insects be considered as bearing a relation to man, and as assisting him in the pleasures or necessities of life, they will, even in this respect, sink in the comparison with the larger tribes of Nature. It is true that the bee, the silk-worm, the cochineal fly, and the cantharides, render him signal services; but how many others of this class, are either noxious or totally unserviceable to him. Even in a country like ours, where all the noxious animals have been reduced by repeated assiduity, the insect tribes still maintain their ground, and are but too often unwelcome intruders upon the fruits of human industry. But in more uncultivated regions, their annoyance and devastations are terrible. What an uncomfortable life must the natives lead in Lapland, and some parts of America, where if a candle be lighted, the insects swarm in such abundance, as instantly to extinguish it with their numbers; where the inhabitants are obliged to smear their bodies and faces with tar, or some other composition, to protect them from the puncture of their minute enemies; where, though millions are destroyed, famished millions are still seen to succeed, and to make the torture endless!

Their amazing number is also an argument of their imperfection. It is a rule that obtains through all Nature, that the nobler animals are slowly produced, and that Nature acts with a kind of dignified economy; but the meaner births are lavished in profusion, and thousands are brought forth merely to supply the necessities of the more favourite objects of Creation. Of all other productions in Nature, insects are the most numerous. Vegetables that cover the surface of the earth bear no proportion to their multitudes; and though, at first sight, herbs of the field seem to be the parts of organized Nature produced in the greatest abundance, yet upon minuter inspection, we shall find every plant supporting a number of scarce perceptible creatures, that fill up the various stages of youth, vigour, and age, in the compass of a few days'existence

All other animals are capable of some degree of education; their instincts may be suppressed or altered; the dog may be taught to fetch and carry; the bird to whistle a tune; and the serpent to dance; but the insect has but one invariable method of operating; no arts can turn it from its instincts; and, indeed, its life is too short for instruction, as a single season often terminates its existence.

For these reasons, the insect tribe are deservedly placed in the lowest rank of Animated Nature; and, in general, they seem more allied to the vegetables on which they feed, than to the noble classes above them. Many of them are attached to one vegetable, often to a single leaf; there they increase with the flourishing plant, and die as it decays; a few days fill up the measure of their contemptible lives; while the ends for which they were produced, or the pleasures they enjoyed, to us, at least, are utterly unknown.

Yet while I am thus fixing the rank of a certain class of animals, it seems necessary to define the nature of those animals which are thus degraded. Definitions in general produce little knowledge; but here, where the shades of Nature are so intimately blended, some discrimination is necessary to prevent confusion. The smallness of the animal, for instance, does not constitute an insect; for then many of the lizard kind, which are not above two inches long, would come under this denomination, and if the smaller lizards, why not the crocodile? which would be a terrible insect indeed! In the same manner, smallness, with a slow creeping motion, does not constitute an insect; for, though snails might be called insects with the same propriety, the whole tribe of sea-shell fish would then have equal pretensions; and a very troublesome innovation would be brought into our language, which is already formed. Excluding such animals, therefore, from the insect tribe, we may define insects to be *little animals without red blood, bones, or cartilages, furnished with a trunk, or else a mouth opening lengthwise, with eyes which they are incapable of covering, and with lungs which have their openings on the sides.* This definition comprehends the whole class of insects, whether with or without wings; whether in their caterpillar or butterfly state; whether produced in the ordinary method of generation between male and female, or from an animal that is itself both male and female, or from the same animal cut into several parts, and each part producing a perfect animal.

From hence it appears, that in this class of animals there are numerous distinctions, and that a general description will by no means serve for all. Almost every species has its own distinct history; and exhibits manners, appetites, and modes of propagation, peculiarly its own. In the larger ranks of existence, two animals that nearly resemble each other in form will be found to have a similar history; but here insects almost entirely alike will be often found perfectly dissimilar, as well in their manner of bringing forth and subsisting, as in the changes which they undergo during their short lives. Thus as this class is prolific beyond computation, so are its varieties multiplied beyond the power of description. The attempt to enumerate all the species of a fly or a moth would be very fruitless; but to give a history of all would be utterly impracticable; so various are the appetites, the manners, and the lives of this humble class of beings, that every species requires its distinct history. An exact plan, therefore, of Nature's operations in this minute set of creatures is not to be expected;

and yet such a general picture may be given, as is sufficient to show the protection which providence affords its smallest as well as its largest productions, and to display that admirable circulation in Nature by which one set of living beings find subsistence from the destruction of another; and by which life is continued without a pause in every part of the Creation.

Upon casting a slight view over the whole insect tribe just when they are supposed to rouse from their state of annual torpidity, when they begin to feel the genial influence of spring, and again exhibit new life in every part of Nature, their numbers and their varieties seem to exceed all powers of calculation, and they are indeed too great for description. When we look closer, however, we shall find some striking similitudes, either in their propagation, their manners, or their form, that give us a hint for grouping several of them into one description, and thus enabling us to shorten the labour of a separate history for every species. Swammerdam, Reaumur, and Linnæus, have each attempted to abridge the task of description, by throwing a number of similar animals into distinct classes, and thus making one general history stand for all. I will avail myself of their labours; and uniting their general distinctions, throw the whole class of insects into four separate distributions, giving under each the history of every species that seems to me considerable enough to deserve our notice. Thus our labour will be shortened; and the very rank in which an insect is placed, will, in some measure, exhibit a considerable part of its history.

In our cursory inspection of the insect tribe, the first animals that offer themselves are those which want wings, that appear crawling about on every plant, and on every spot of earth we regard with any degree of attention. Of these, some never obtain wings at any period of their existence, but are destined to creep on the vegetable, or the spot of earth where they are stationed, for their whole lives. On the contrary, others are only candidates for a more happy situation; and only wait their growing wings, when they may be said to arrive at their state of full perfection.

Those that never have wings, but creep about till they die, may be considered as constituting the *first class* of insects. All these, the flea and the wood-louse only excepted, are produced from an egg; and when once they break the shell, they never suffer any further change of form, but continue to grow larger till they die. Thus the louse or the spider are produced from an egg, never suffering any alteration when once they are excluded; but, like the chicken or the duck, remaining invariably the same, from their birth to their dissolution.

The *second order* of insects consists of such as have wings; but which, when produced from the egg, have those wings cased up in such a manner as not to appear. This casing up of the wing, however, does not prevent the animal's running, leaping and moving with its natural celerity; but when the case bursts, and the wings have a power of expanding, all the animal's motions become more extensive, and the animal arrives at full perfection. Thus the grasshopper, the dragon fly, and the ear-wig, have their wings at first bound down; but when the skin that, like a pair of stays, kept them confined, bursts, they are then expanded, and the animal pursues the purposes for which it was produced.

The *third order* of insects is of the moth and butterfly kind. These all have four wings, each covered with a mealy substance of various colours, which when handled comes off upon the fingers; and, if examined by the microscope, will appear like scales, with which the wing is nicely embroidered all over. These insects also are produced in a manner peculiar to themselves. They are first hatched from an egg, from whence proceeds a caterpillar that eats, and often casts its skin; the caterpillar having divested itself for the last time, assumes a new covering, which is called a chrysalis, or the cone of the silk-worm, in which it continues hidden till it comes forth a perfect moth, or butterfly

The *fourth order* is of those winged insects which come from a worm instead of a caterpillar, and yet go through changes similar to those which moths and butterflies are seen to undergo. They are first excluded from the egg as a worm, and then become a chrysalis; in some, their wings and legs are seen; in others, the animal is quite detached from the cone in which it is concealed; but all at length break their prison, and come out perfect winged animals; some furnished with two wings and some with four. The wings of all these differ from those of the butterfly and moth kind, by not having the mealy scales which are ever found on the wings of the former. In this class we may place the numerous tribes of gnats, beetles, bees, and flies.

To these I will add as a *fifth order*, a numerous tribe lately discovered, to which naturalists have given the name of Zoophytes. These do not go through the ordinary forms of generation, but may be propagated by dissection. Some of these, though cut into a hundred parts, still retain life in each, and are endued with such a vivacious principle, that every part will in a short time become a perfect animal.—They seem a set of creatures placed between animals and vegetables, and make the shade that connects Animated and Insensible Nature. To this class belong the polypus, the earth-worm, and all the varieties of the sea-nettle.

Having thus given a general distribution of insects, I will proceed to describe each class in the order I have mentioned them; beginning with insects without wings, as they more nearly resemble the higher ranks of Nature, as well in their habits as their conformation.

CHAPTER II.

OF INSECTS WITHOUT WINGS.

EVERY moment's observation furnishes us with instances of insects without wings; but the difficulty is to distinguish those which are condemned continually to lead reptile lives, from such as only wait the happy moment of transmutation. For this, nothing but a long and intimate acquaintance will suffice; but, in general, all animals resembling the flea, the louse, the spider, the bug, the woodlouse, the water louse, and the scorpion, never acquire wings, but are produced from the egg in that form which they never change afterwards.

If we consider this class as distinct from others, we shall find them in general longer lived than the rest, and often continuing their term beyond one season, which is the ordinary period of an insect's existence. They seem also less subject to the influence of the weather; and often endure the rigours of winter without being numbed into torpidity. The whole race of moths, butterflies, bees, and flies, are rendered lifeless by the return of cold weather; but we need not be told, that the louse, the flea, and many of these wingless creatures that seem formed to tease mankind, continue their painful depredations the whole year round.

They come to perfection in the egg, as was said before; and it sometimes happens that when the animal is interrupted in performing the offices of exclusion, the young ones burst the shell within the parent's body and are thus brought forth alive. This not unfrequently happens with the wood-louse, and others of the kind, which are sometimes seen producing eggs, and sometimes young ones perfectly formed.

Though these creatures are perfect from the beginning, yet they are often, during their existence, seen to change their skin: this is a faculty which they possess in common with many of the higher ranks of animals, and which answers the same purposes. However tender their skins may seem to our feel, yet, if compared to the animal's strength and size, they will be found to resemble a coat of mail, or, to talk more closely, the shell of a lobster. By this skin these animals are defended from accidental injuries, and particularly from the attacks of each other. Within this they continue to grow till their bodies become so large, as to be imprisoned in their own covering, and then the shell bursts, but is quickly replaced by a new one.

Lastly, these animals are endued with a degree of strength for their size, that at first might exceed credibility. Had man an equal degree of strength, bulk for bulk, with a louse or flea, the history of Samson would be no longer miraculous. A flea will draw a chain a hundred times heavier than itself; and to compenate for this force, will eat ten times its own sise of provisions in a single day.

CHAPTER III.

OF THE SPIDER AND ITS VARIETIES.

THE animal that deserves our first notice in this principal order of insects is the spider, whose manners are, of all others, the most subtle, and whose instincts are most various.—Formed for a life of rapacity, and incapable of living upon any other than insect food, all its habits are calculated to deceive and surprise; it spreads toils to entangle its prey; it is endued with patience to expect its coming; and is possessed of arms and strength to destroy it when fallen into the snare.

In this country, where all the insect tribes are kept under by human assiduity, the spiders are but small and harmless. We are acquainted with few but the house spider, which weaves its web in neglected rooms; the garden-spider, that spreads its toils from tree to tree, and rests in the centre; the wandering-spider, that has no abode like the rest; and the field-spider that is sometimes seen mounting, web and all, into the clouds.—These are the chief of our native spiders; which, though reputed venomous, are entirely inoffensive. But they form a much more terrible tribe in Africa and America. In those regions, where all the insect species acquire their greatest growth, where the butterfly is seen to expand a wing as broad as our sparrow, and the ant to build a habitation as tall as a man, it is not to be wondered at that the spiders are seen bearing a proportionable magnitude. In fact, the bottom of the Martinico spider's body is as large as a hen's egg, and covered all over with hair. Its web is strong, and its bite dangerous. It is happy for us, however, that we are placed at a distance from these formidable creatures, and that we can examine their history without feeling their resentment.

Every spider has two divisions in its body. The fore part, containing the head and breast, is separated from the hinder part of the belly by a very slender thread, through which, however, there is a communication from one part to the other. The fore part is covered with a hard shell, as well as the legs, which adhere to the breast. The hinder part is clothed with a supple skin, beset all over with hair. They have several eyes all round the head, brilliant and acute; these are sometimes eight in number, sometimes but six; two behind, two before, and the rest on each side. Like all other insects, their eyes are immoveable, and they want eye-lids; but this organ is fortified with a transparent horny substance, which at once secures and assists their vision. As the animal procures its subsistence by the most watchful attention, so large a number of eyes was necessary to give it the earliest information of the capture of its prey. They have two pincers on the fore part of the head, rough, with strong points, toothed like a saw, and terminating in claws like those of a cat. A little below the point of the claw there is a small hole, through which the animal emits a poison, which though harmless to us, is sufficiently capable of instantly destroying its prey. This is the most powerful weapon they have against their enemies; they can open or extend these pincers as occasion may require; and when they are undisturbed, they suffer them to lie one upon the other, never opening them but when there is a necessity for their exertion. They have all eight legs, jointed like those of lobsters, and similar also in another respect; for if a leg be torn away, or a joint cut off, a new one will quickly grow in its place, and the animal will find itself fitted for combat as before. At the end of each leg there are three crooked moveable claws; namely, a small one, placed higher up, like a cock's spur, by the assistance of which it adheres to the threads of its web. There are two others larger, which meet together like a lobster's claw, by which they can catch hold of the smallest depressions, walking up or down the very polished surfaces, on which they can find inequalities that are imperceptible to our grosser sight. But when they walk upon such bodies as are perfectly smooth, as looking-glass or polished marble, they squeeze a little sponge, which grows near the extremity of their claws, and thus diffusing a glutinous substance, adhere to the surface until they make a second step. Besides the eight legs just mentioned, these animals have two others, which may more properly be called arms, as they do not serve to assist motion, but are used in holding and managing their prey.

The spider, though thus formidably equipped, would seldom prove successful in the capture, were it not equally furnished with other instruments to assist its depredations.—As it lives wholly upon flies, and is withou wings to pursue them, it is obvious they must forever escape so impotent an adversary; but the spider is a most experienced hunter, and spreads its nets to catch those animals it is unable to pursue. The spider's web is generally laid in those places where flies are most apt to come and shelter; in the corners of rooms, round the edges of windows, and in the open air among the branches of trees. There the little animal remains for days, nay, weeks together, in patient expectation, seldom changing its situation though never so unsuccessful.

For the purposes of making this web, Nature has supplied this animal with a large quantity of glutinous matter within its body, and five dugs or teats for spinning it into thread. This substance is contained in a little bag, and at first sight it resembles soft glue; but when examined more accurately, it will be found twisted into many coils of an agate colour, and upon breaking it, the contents may be easily drawn out into threads, from the tenacity of the substance, not from those threads being already formed. Those who have seen the machine by which wire is spun, will have an idea of the manner in which this animal forms the threads of its little net, the orifices of the five teats above-mentioned, through which the thread is drawn, contracting or dilating at pleasure. The threads which we see, and appear so fine, are, notwithstanding, composed of five joined together, and these are many times doubled when the web is in formation.

When a house-spider proposes to begin a web, it first makes choice of some commodious spot, where there is an appearance of plunder and security. The animal then distils one little drop of its glutinous liquor, which is very tenacious, and then creeping up the wall, and joining its thread as it proceeds, it darts itself in a very surprising manner, as I have often seen, to the opposite place, where the other end of the web is to be fastened. The first thread thus formed, drawn tight, and fixed at each end, the spider then runs upon it backward and forward, still assiduously employed in doubling and strengthening it, as upon its force, depends the strength and stability of the whole. The scaffolding thus completed, the spider makes a number of threads parallel to the first, in the same manner, and then crosses them with others; the clammy substance of which they are formed, serving to bind them, when newly made, to each other. The insect, after this operation, doubles and trebles the thread that borders its web, by opening all its teats at once, and secures the edges, so as to prevent the wind from blowing the work away. The edges being thus fortified, the retreat is next to be attended to; and this is formed like a funnel at the bottom of the web, where the little creature lies concealed. To this are two passages, or outlets, one above and the other below, very artfully contrived, to give the animal an opportunity of making excursions at proper seasons, of prying into every corner, and cleaning those parts which are observed to be clogged or encumbered. Still attentive to its web, the spider, from time to time, cleans away the dust that gathers round it, which might otherwise clog, and incommode it: for this purpose it gives the whole a shake with its paws; still, however, proportioning the blow so as not to endanger the fabric. It often happens also, that from the main web there are several threads extended at some distance on every side; these are, in some measure, the outworks of the fortification, which, whenever touched from without, the spider prepares for attack or self-defence. If the insect impinging be a fly, it springs forward with great agility; if on the contrary, it be the assault of an enemy stronger than itself, it keeps within its fortress, and never ventures out till the danger be over. Another advantage which the spider reaps from this contrivance of a cell or retreat behind the web, is, that it serves for a place where the creature can feast upon its game with all safety, and conceal the fragments of those carcasses which it has picked, without exposing to public view the least trace of barbarity, that might create a suspicion in any insect that their enemy was near.

It often happens, however, that the wind, or the rustling of the branches, or the approach of some large animal, destroys in a minute the labours of an age. In this case the spider is obliged to remain a patient spectator of the universal ruin; and when the danger is passed away, it sets about repairing the calamity. For this purpose, it is furnished with a large store of the glutinous substance of which the web is made; and with this, it either makes a new web or patches up the old one. In general, however, the animal is much fonder of mending, than making, as it is furnished originally with but a certain quantity of glutinous matter, which, when exhausted, nothing can renew. The time seldom fails to come, when their reservoirs are entirely dried up, and the poor animal is left to all the chances of irretrievable necessity. An old spider is thus frequently reduced to the greatest extremity; its web is destroyed, and it wants the materials to make a new one. But as these animals have been long accustomed to a life of shifting, it hunts about to find out the web of another spider, younger and weaker than itself, with whom it ventures a battle. The invader generally succeeds; the young one is driven out to make a new web, and the old one remains in quiet possesion. If, however, the spider is unable to dispossess any other of its web, it then endeavours, for a while, to subsist upon accidental depredation; but in two or three months it inevitably dies with hunger.

The garden-spider seems to work in a different manner. The method with this insect is to spin a great quantity of thread, which floating in the air in various directions, happens from its glutinous quality, at last to stick to some object near it, a lofty plant or the branch of a tree. The spider only wants to have one end of the line fast, in order to secure and tighten the other. It accordingly draws the line when thus fixed, and then by passing and repassing upon it, strengthens the thread in such a manner as to answer all its intentions. The first cord being thus stretched, the spider walks along a part of it, and there fastens another, and dropping from thence, fastens the thread to some solid body below, then climbs up again and begins a third, which it fastens by the same contrivance. When three threads are thus fixed, it forms a square, or something that very nearly resembles one, and in this the animal is generally seen to reside. It often happens, however, when the young spider begins spinning, that its web becomes too buoyant, and not only the thread floats in the air, but even the little spinster. In this manner we have often seen the threads of spiders floating in the air; and what is still more surprising, the young spiders themselves attached to their own web. The reason is obvious; for as even gold itself may be so finely drawn out as to float in the air, so the finer thread of a spider is so buoyant as not only to swim in the air, but also to lift the spider itself; which, like the tail of a kite, rises with its own manufacture.

The spider's web being thus completed, and fixed in a proper place, its next care is to seize and secure whatever insect happens to be caught in the toil. For this purpose, it remains for weeks and even months upon the watch, without ever catching a single fly; for the spider, like most other insects, is surprisingly patient of hunger. It sometimes, happens that too strong a fly strikes itself against the web, and thus, instead of being caught, tears the net to pieces. In general, however, the butterfly or the hornet when they touch the web, fly off again. and the spider seems no way disposed to interrupt their retreat. The large blue-bottle-fly, the ichneumon-fly, and the common meat-fly, seem to be its favourite game. When one of these strike into the toils, the spider is instantly seen alert and watchful at the mouth of its hole, careful to observe whether the fly be completely immeshed; If that be the case the spider walks leisurely forward, seizes its prey, and instantly kills it by instilling a venomous juice into the wound it makes. If, however, the fly be not entirely immeshed, the spider patiently waits, without appearing until its prey has fatigued itself by its struggles to obtain its liberty; for if the ravager should appear in all its terrors while the prey is but half involved, a desperate effort might give it force enough to get free. If the spider has fasted for a long time, it then drags the fly immediately into its hole and devours it; but if there has been plenty of game, and the animal be no way pressed by hunger, it then gives the fly two or three turns in its web, so as completely to immesh it, and there leaves it impotently to struggle until the little tyrant comes to its appetite. Why the spider should at one time kill its prey, and at another suffer it to struggle in the toils for several hours together, I am not able to say; perhaps it only likes its prey newly killed, and therefore delays to put the captive to death until it is to be eaten.

It has been the opinion of some philosophers, that the spider was in itself both male and female; but Lister has been able to distinguish the sexes, and to perceive that the males are much less in size than the females. But this is not the chief peculiarity; for, different from all other animals, except the fish called the *Ray*, it has its instruments of generation placed in the fore-arms, which have been already described. When these animals copulate, they for some time tease each other with their legs and arms, then appear the instruments of generation in the male, as if bursting out from the points of its fore-feet, and are inserted into the receptacle beneath the body of the female.

The female generally lays from nine hundred to a thousand eggs in a season; they are of a bluish colour, speckled with black, and separated from each other by a glutinous substance, not unlike frog spawn water. These eggs are large or small in proportion to the size of the animal that produces them. In some they are as large as a grain of mustard seed; in others they are scarcely visible. The female never begins to lay till she be two years old at the least, and her first brood is never so numerous as when she has come to her greatest maturity.

When the number of eggs which the spider has brought forth, have remained for an hour or two to dry after exclusion, the little animal then prepares to make them a bag, where they are to be hatched until they leave the shell. For this purpose, she spins a web four or five times stronger than that made for catching flies; and besides, lines it within side by a down, which she plucks from her own breast. This bag, when completed, is as thick as paper, is smooth within side, but rougher without. Within this they deposit their eggs; and it is almost incredible to relate the concern and industry which they bestow in the preservation of it. They stick it by means of their glutinous fluid to the end of their body; so that the animal, when thus loaded, appears as if she had one body placed behind another. If this bag be separated from her by any accident, she employs all her assiduity, to stick it again in its former situation, and seldom abandons her treasure but with her life. When the young ones are excluded from their shells, within the bag, they remain for some time in their confinement, until the female, instinctively knowing their maturity, bites open their prison, and sets them free. But her parental care does not terminate with their exclusion: she receives them upon her back for some time, until they have strength to provide for themselves, when they leave her never to return, and each begins a separate manufactory of its own. The young ones begin to spin when they can scarcely be discerned; and prepare for a life of plunder before they have strength to overcome. Indeed, Nature seems to have formed them in every respect for a life of hostility. No other insect is possessed of such various powers of assault and defence; and they are able to destroy animals ten times bigger than themselves. Even after a severe defeat, they quickly recover of their wounds; and as for their legs they consider they loss of them as but a small misfortune, as they grow again very speedily to their former magnitude.

Thus there is no insect to which they are not an enemy; but what is more barbarous still, spiders are the enemies of each other. Mr. Reaumur, who was fond of making experiments upon insects, tried to turn the labours of the spider to human advantage, and actually made a pair of gloves from their webs. For this purpose, he collected a large number of those insects together; he took care to have them constantly supplied with flies, and the ends of young feathers, fresh picked from chickens and pigeons, which being full of blood are a diet that spiders are particularly fond of. But, notwithstanding all his care, he was soon convinced, that it was impracticable to rear them, since they were of such a malignant nature, that they could never be brought to live in society; but instead of their usual food, chose to devour each other. Indeed were it practicable to reconcile them to each other, it would require too much attendance to rear up a sufficient number to make the project any way useful. Their thread is four, if not five times finer than that of the silk-worm; so that upon the smallest calculation, there must have been sixty thousand spiders to make a single pound of silk. That which Reaumur made use of was only the web in which they deposited their eggs, which is five times stronger than their ordinary manufacture.

Of this animal, there are several kinds, slightly differing from each other, either in habits or conformation The Water-spider is the most remarkable. Of the number. This insect resembles the common spider in its appearance, except that its hinder part is made rather in the shape of a nine-pin than a ball. They differ in being able to live as well by land as water; and in being capable of spinning as well in one element as the other.

Their appearance under water is very remarkable; for though they inhabit the bottom, yet they are never touched by the element, in which they reside, but are inclosed in a bubble of air that, like a box, surrounds them on every side. This bubble has the bright appearance, at the bottom, of quicksilver; and within this, they perform their several functions of eating, spinning and sleeping, without its ever bursting, or in the least disturbing their operations: sometimes, the bubble is seen divided into three distinct apartments; and in the spring, the male enters one of those to impregnate the female in the manner mentioned above, while the bubble in which he was contained unites with the other, like two drops of water, when approached to each other. They spin their webs as well in the water as upon land; and it is most probable that they make their food of the small insects of either element.

The Tarantula is also of this species, and deserves particular notice, not for any remarkable properties that really attend it, but for the numerous falsehoods which have been propagated concerning it. What may be said with truth concerning it is, that it is the largest of the spider kind known in Europe, and is a native of Apulia in Italy. Its body is three quarters of an inch long, and about as thick as one's little finger; the colour is generally an olive brown, variegated with one that is more dusky: it has eight legs and eight eyes, like the rest, and nippers, which are sharp and serrated: between these and the fore legs, there are two little horns, or feelers, which it is observed to move very briskly when it approaches its prey. It is covered all over the body with a soft down, and propagates, as other spiders, by laying eggs. In the summer months, particularly in in the dog days, the tarantula creeping among the corn, bites the mowers and passengers: but in winter it lurks in holes, and is seldom seen.

Thus far is true; but now the fable begins: for though the bite is attended with no dangerous symptoms, and will easily cure of itself, wonderful stories are reported concerning its virulence. The part which is bitten, as we are told, is soon after discoloured with a livid black, or yellowish circle, attended with an inflammation. At first the pain is scarcely felt; but a few hours after come on a violent sickness, difficulty of breathing, fainting, and sometimes trembling. The person bit after this does nothing but laugh, dance, skip about, putting himself into the most extravagant postures, and sometimes is also seized with a most frightful melancholy. At the return of the season in which he was bit, his madness begins again; and the patient always talks of the same things. Sometimes he fancies himself a shepherd: sometimes a king; appearing entirely out of his senses. These troublesome symptoms sometimes return for several years successively, and at last terminate in death. But so dreadful a disorder has, it seems, not been left without a remedy; which is no other than a well-played fiddle. For this purpose the medical musician plays a particular tune, famous for the cûre, which he begins slow, and increases in quickness as he sees the patient affected. The patient no sooner hears the music, but he begins to dance; and continues so doing till he is all over in a sweat, which forces out the venom that appeared so dangerous. This dancing sometimes continues for three or four hours, before the patient is weary, and before the sweating is copious enough to cure the disorder. Such are the symptoms related of the tarantula poison; symptoms which some of the best and gravest physicians have credited, and attempted to account or. But the truth is, that the whole is an imposition of the peasants upon travellers who happen to pass through that part of the country, and who procure a trifle for suffering themselves to be bitten by the tarantula. Whenever they find a traveller willing to try the experiment, they readily offer themselves, and are sure to counterfeit the whole train of symptoms, which music is supposed to remove. A friend of mine, who had passed through that part of the country, had a trusty servant bitten, without ever administering the musical cure: the only symptoms were a slight inflammation, which was readily removed, and no other consequence ever attended the bite.—It is thus that falsehoods prevail for a century or two; and mankind at last begin to wonder how it was possible to keep up the delusion so long.

CHAPTER IV.

OF THE FLEA

THE history of those animals with which we are the best acquainted, are the first objects of our chiefest curiosity.—There are few but are well-informed of the agility and blood-thirsty disposition of the flea; of the caution with which it comes to the attack; and the readiness with which it avoids the pursuit. This insect, which is not only the enemy of mankind, but of the dog, cat, and several other animals, is found in every part of the world, but bites with greater severity in some countries than in others. Its numbers in Italy and France are much greater than in England; and yet its bite is much more troublesome here than I have found in any other place. It would seem that its force increases with the coldness of the climate; and, though less prolific, that it became more predaceous.

If the flea be examined with a microscope, it will be observed to have a small head, large eyes, and a roundish body. It has two feelers, or horns, which are short, and composed of four joints; and between these lies its trunk, which it buries in the skin, and through which it sucks the blood in large quantities. The body appears to be all over curiously adorned with a suit of polished sable armour, neatly joined, and beset with multitudes of sharp pins, almost like the quills of a porcupine. It has six legs, the joints of which are so adapted, that it can, as it were, fold them up one within another; and when it leaps, they all spring out at once, whereby its whole strength is exerted, and the body raised above two hundred times its own diameter.

The young fleas are at first a sort of nits or eggs, which are round and smooth; and from these proceed white worms, of a shining pearl colour: in a fortnight's time they come to a tolerable size, and are very lively and active; but if they are touched at this time, they roll themselves up in a ball: soon after this they begin to creep like silk-worms that have no legs: and they seek a place to lie hid in, where they spin a silken thread from their mouth, and with this they inclose themselves in a small round bag or case, as white within as writing paper, but dirty without: in this they continue for a fortnight longer; after which they burst from their confinement perfectly formed, and armed with powers to disturb the peace of an emperor.

CHAPTER V.

OF THE LOUSE AND ITS VARIETIES.

THE antipathies of mankind are various; some considering the toad, some the serpent, some the spider, and some the beetle, with a strong degree of detestation; but while all wonder at the strangeness of each other's aversion, they all seem to unite in their dislike to the louse, and regard it as their natural and most nauseous enemy. Indeed, it seems the enemy of man in the most odious degree; for wherever wretchedness, disease, or hunger seize upon him, the louse seldom fails to add itself to the tribe, and to increase in proportion to the number of his calamities.

In examining the human louse with the microscope, its external deformity first strikes us with disgust: the shape of the fore part of the head is somewhat oblong: that of the hind part somewhat round: the skin is hard, and being stretched, transparent, with here and there several bristly hairs: in the fore part is a proboscis or sucker, which is seldom visible: on each side of the head are antennæ, or horns, each divided into five joints, covered with bristly hair; and several white vessels are seen through these horns: behind these are the eyes, which seem to want those divisions observable in other insects, and appear encompassed with some few hairs: the neck is very short, and the breast is divided into three parts; on each side of which are placed six legs, consisting of six joints covered with bristly hairs; the ends of the legs are armed with two smaller and larger ruddy claws, serving those insects as a finger and thumb, by which they catch hold of such objects as they approach: the end of the body terminates in a cloven tail, while the sides are all over hairy; the whole resembling clear parchment, and, when roughly pressed, cracking with a noise.

When we take a closer view, its white veins, and other internal parts, appear, as likewise a most wonderful motion in its intestines, from the transparency of its external covering. When the louse feeds, the blood is seen to rush, like a torrent, into the stomach; and its greediness is so great, that the excrements contained in the intestines are ejected at the same time, to make room for this new supply.

The louse has neither beak, teeth, nor any kind of mouth, as Dr. Hooke described it, for the entrance into the gullet is absolutely closed. In the place of all these, it has a proboscis or trunk, or, as it may be otherwise called, a pointed, hollow sucker, with which it pierces the skin, and sucks the human blood, taking that for food only. The stomach is lodged partly in the breast and back; but the greatest portion of it is in the abdomen. When swollen with blood, it appears of a dark brown colour, which is visible through the skin; and is either a faint red, or a full or bright brown, as the contents of the stomach are more or less changed. When it is empty it is colourless; but when filled it is plainly discernable, and its motion seems very extraordinary. It then appears working with very strong agitations, and somewhat resembles an animal within an animal. Superficial observers are apt to take this for the pulsation of the heart; but if the animal be observed when it is sucking, it will then be found that the food takes a direct passage from the trunk to the stomach, where the remainder of the old aliment will be seen mixing with the new, and agitated up and down on every side.

If this animal be kept from food two or three days, and then placed on the back of the hand, or any soft part of the body, it will immediately seek for food; which it will the more readily find, if the hand be rubbed till it grows red.—The animal then turns its head, which lies between the two fore legs to the skin, and diligently searches for some pore: when found, it fixes the trunk therein; and soon the microscope discovers the blood ascending through the head, in a very rapid, and even frightful stream. The louse has at that time sufficient appetite to feed in any posture; it is then seen sucking with its head downward, and its tail elevated. If, during this operation, the skin be drawn tight, the trunk is bound fast, and the animal is incapable of disengaging itself; but it more frequently suffers from its gluttony, since it gorges to such a degree, that it is crushed to pieces by the slightest impression.

Whether lice are distinguished by the parts of generation into males and females, is not yet discovered: Swammerdam is inclined to think that they are hermaphrodites, having found an ovary, in all those he examined; and he dissected not less than forty-two. In one of these animals were found ten large eggs, and forty-four smaller, that were not yet come to their full perfection.

There is scarce any animal that multiplies so fast as this unwelcome intruder. It has been pleasantly said that a louse becomes a grandfather, in the space of twenty four hours; this fact cannot be ascertained; but nothing is more true than that the moment the nit, which is no other than the egg of the louse, gets rid of its superfluous moisture, and throws off its shell, but it then begins to breed in its turn. Nothing so much prevents the increase of this nauseous animal as cold and want of humidity; the nits must be laid in a place that is warm, and moderately moist, to produce any thing. This is the reason that many nits laid on the hairs in the night-time, are destroyed by the cold of the succeeding day; and so stick for several months, till they at last come to lose even their external form.

The louse is found upon every part of the human body; but particularly in the heads of children. Those found upon the miners in Sweden, are said by Linnæus to be very large; and he is of opinion that the head and the body-louse differ in no respect from each other. The pthiriasis, or lousy disease, though very little known at present, was frequent enough among the ancients: Herod, Antiochus, Epiphanes, Alcman, the poet, Pherecydes, Cassander, Callisthenes, and Sylla, all died of this disorder. The use of mercury which was unknown among the ancients, may probably have banished it from among the moderns; for certain it is, that these animals seldom attack any in our climate, but such as from sloth or famine invite their company.

Such is the history of the human louse, which, from its connection with mankind, deserves first notice: but it would be endless to describe the various tribes that go under this name, and swarm upon every part of Na ture There is scarce an animal and scarce even a vegetable, that does not suffer under its own peculiar louse. The sheep, the horse, the hog, and the elephant, are all teased by them; the whale, the shark, the salmon, and the lobster, are not without their company; while every hothouse, and every garden is infested with some peculiarly destructive, Linnæus tells us, that he once found a vegetable-louse upon some plants newly arrived from America; and, willing to trace the little animal through its various stages, he brought it with him from London to Leyden, where he carefully preserved it during the winter, until it bred in the spring; but the louse it seems did not treat him with all the gratitude he expected; for it became the parent of so numerous a progeny, that it soon overrun all the physic-garden of that beautiful city; and leaves, to this day, many a gardener to curse the Swede's too indulgent curiosity.

The animal which some have called the Leaf-Louse, is of the size of a flea, and of a bright green, or bluish green colour; the body is nearly oval, and is largest and most convex on the hinder part; the breast is very small and the head is blunt and green: the eyes may be seen very plainly, being prominent on the fore part of the head, and of a shining black colour; near these there is a black line on each side; and the legs are very slender.

These animals are usually found upon the leaves of the orache, and other plants; and the weaker the leaves and buds are, these insects swarm upon them in greater abundance. Some plants are covered over with them; though they are not the cause of the plant's weakness, but the sign however, by wounding and sucking the leaf, they increase the disease They generally assume their colour from the plant on which they reside. Those that feed upon pot-herbs and plum-trees, are of an ash-colour; only they are greenish when they are young: those that belong to the alder and cherry-tree, are black; as also those upon beans, and some other plants: those on the leaves of apples and rose-trees, are white; but as they leap, like grass-hoppers, some place them in the number of the flea kind. The most uncommon colour is reddish; and lice of this sort may be found on the leaves of tansey; and their juice, when rubbed in the hands, tinges them with no disagreeable red. All these live upon their respective plant; and are often engendered within the very substance of the leaf.

All these bring forth their young alive; and the fœtus, when it is ready to be brought forth, entirely fills the belly of the female; its fore parts being excluded first, and then the hinder. The young one does not begin to move till the horns or feelers appear out of the body of the old one; and by the motion of these it first shows signs of life, moving them in every direction, and bending all their joints. When the horns and head are excluded, the two fore-feet follow, which they move with equal agility; after this follow the middle feet, and then the hinder: still, however, the young one continues sticking to its parent, supported only at one extremity, and hanging, as it were in air, until its small and soft members become hardened and fitted for self-support.—The parent then gets rid of its burden; by moving from the place where she was sitting, and forcing the young one to stand upon its legs, leaves it to shift for itself.

As the animal has not far to go, its provisions lying beneath it, during the summer it continues to eat and creep about with great agility. But as it is viviparous, and must necessarily lurk somewhere in winter, where its body may be defended from the cold, it endeavours to secure a retreat, near the trees or plants that serve to nourish it in the beginning of spring. They never hide themselves in the earth, like many other insects, because they have no part of their bodies fitted to remove the earth; nor can they creep into every chink, as their legs are too long: besides, their bodies are so tender, that the least rough particle of the earth would hurt them. They, therefore, get into the deep chinks of the bark, and into the cavities of the stronger stalks, from whence they sally out upon the branches and leaves, when the warmth of the sun begins to be felt. Neither the cold in the autumnal season, nor the lesser degree of heat in the spring, ever hurts them; they seldom, therefore seek for hiding places before the fall of the leaf, and are alert enough to take the earliest advantage of the returning spring.

Like many other insects, they cast their skins four several times; and, what is very remarkable, the males have four wings, but the females never have any. They all have long legs not only to enable them to creep over the long hairs of plants or leaves, but also to travel from one tree to another when they happen to stand at a distance. Their trunk or snout lies under their breast; and this they thrust into the pores of the plant to suck out the juice, for they do not gnaw them like the caterpillar; but so hurt them by sucking, that the leaves become spotted, and as it were overrun with scabs; for which reason their edges always turn up towards the middle.

It has been said, that these insects are often carried away and devoured by ants; but this Frysch, from whom this description is taken, could never observe. The ants, indeed, are fond of those trees where there is a great number of those insects; but then it is only to suck the juice which flows from the leaves that have been just wounded. This more particularly happens in the heat of summer, when other moisture is wanting: however, he never found them hurting or carrying away any of these insects while alive; nor indeed were they able, for the leaf-louse is more than a match for the ant at single combat. Whenever they perceive the ant approaching behind them, they kick back with their hinder-feet, and thus drive off the invader as a horse would a lion.

The three principal and constant enemies to these insects are, first, the fire-fly, which lays its eggs where these insects are in greatest number, which, producing a worm, seizes and devours all the leaf-lice that come near it: another enemy is the worm of a peculiar kind of beetle, which destroys them in great numbers: but the most formidable of all enemies, is the ichneumon fly, that seizes upon one of the largest females, and laying its egg upon her, this is hatched into a worm, which soon devours and destroys the animal from whose body it sprung.

CHAPTER VI.

OF THE BUG AND ITS VARIETIES.

THE Bug is another of those nauseous insects that intrude upon the retreats of mankind; and that often banish that sleep, which even sorrow and anxiety permitted to approach. This, to many men, is of all other insects the most troublesome and obnoxious. The night is usually the season when the wretched have rest from their labour; but this seems the only season when the bug issues from its retreats, to make its depredations. By day it lurks, like a robber, in the most secret parts of the bed; takes the advantage of every chink and cranny, to make a secure lodgment; and contrives its habitation with so much art, that scarce any industry can discover its retreat. It seems to avoid the light with great cunning; and even if candles be kept burning, this formidable insect will not issue from its hiding-place. But when darkness promises security, it then issues from every corner of the bed, drops from the teaster, crawls from behind the arras, and travels with great assiduity to the unhappy patient, who vainly wishes for rest and refreshment. It is generally vain to destroy one only, as there are hundreds more to revenge their companion's fate; so that the person who thus is subject to be bitten, remains the whole night like a centinel upon duty, rather watching the approach of fresh invaders, than inviting the pleasing approaches of sleep.

Nor are these insects less disagreeable from their nauseous stench, than their unceasing appetites. When they begin to crawl, the whole bed is infected with the smell: but if they are accidentally killed, then it is insupportable.

These are a part of the inconveniences that result from the persecution of these odious insects: but happily for Great Britain, they multiply less in these islands than in any part of the continent. In France and Italy the beds, particularly in their inns, swarm with them; and every piece of furniture seems to afford them a retreat. They grow larger also with them than with us, and bite with more cruel appetite.

This animal, if examined minutely, appears to consist of three principal parts; the head, the corselet, and the belly. It has two brown eyes, that are very small, and a little prominent, besides two feelers, with three joints: underneath these there is a crooked trunk, which is its instrument of torture, and which, when in motion, lies close upon the breast. The breast is a kind of ring, in which are placed the two first pair of legs. The belly consists of nine rings; under which are placed two pair of legs more, making six in all. Each leg has three joints, which form the thigh, the leg, and the foot, which is armed with a crooked claw, like a hook. The body is smooth, except a few short hairs, that may be seen by the microscope, about the vent, and on the two last rings. Its motion is slow and unwieldy; yet its sight is so exquisite, that the instant it perceives the light, it generally makes good its retreat; and they are seldom caught, though the bed swarms with them.

If we examine this insect internally, we shall find the great artery, which in all insects performs the functions of the heart; we shall find the apertures of the lungs on the right side and the left, through which the animal breathes; we shall find a stomach and intestines, which, as in other animals, run from the mouth to the anus If the insect has been kept long fasting, there will be a mucus found in its body, like the white of an egg; but if crushed after a full meal, the human blood which it has sucked in, will appear a little darkened, by having passed through the insect's body.

The male and female of these animals are plainly distinguishable from each other; and the parts of generation are obvious enough. They are often found coupling tail to tail: and in this state are very easily destroyed. The female has an ovary filled with eggs, joined together like a bunch of grapes; each egg being oblong, almost cylindrical, inclining to white, and pretty transparent. In about two days after impregnation by the male, she deposits her eggs to the number of about a hundred and fifty, in some convenient place where they are likely to receive no disturbance There they continue for some months; during which time, neither cold nor heat, neither moisture nor fumigation, can in the least retard their exclusion; but they come forth active and ready for mischief. It is this hardiness in the shell that seems to continue the breed; as the old ones die every winter, or are easily destroyed by any fumigation that is used for that purpose. But the eggs seem incapable of destruction; even those men who make a livelihood by killing these nauseous insects, though they can answer for the parent, can never be sure of the egg. For this reason they usually pay those houses to which they are called, a second or third visit, and at last exterminate them by perseverance.

The manner of destroying them seems rather the effects of assiduity than antidote; for the men called in upon this occasion, take every part of the furniture asunder, brush every part of it with great assiduity, anoint it with a liquid which I take to be a solution of corrosive sublimate, and having performed this operation twice or thrice, the vermin are most usually destroyed.

Cleanliness, therefore, seems to be the best antidote to remove these nauseous insects; and wherever that is wanting, their increase seems to be a just punishment. Indeed, they are sometimes found in such numbers among old furniture, and neglected chambers, exposed to the south that, wanting other sustenance, they devour each other. They are also enemies to other vermin, and destroy fleas very effectually; so that we seldom have the double persecution of different vermin in the same bed Of the bug kind Linnæus reckons up forty.

CHAPTER VII.

OF THE WOOD-LOUSE AND ITS VARIETIES.

THE common wood-louse is seldom above half an inch long, and a quarter of an inch broad. The colour is of a livid black, especially when found about dunghills, and on the ground; but those that are to be met with under tiles and in drier places, are of the colour of the hair of an ass.

It has fourteen feet, seven on each side; and they have only one joint each, which is scarcely perceivable. It has two short feelers, and the body is of an oval shape. When it is touched it rolls itself up into a sort of a ball; and the sides near the feet are dentated like a saw. It is often found among rotten timber, and on decayed trees; in winter it lies hid in the crevices of walls and all sorts of buildings. The male is easily distinguishable from the female, being less and more slender. The eggs they lay are white and shining, like seed pearls, and are very numerous: however, more properly speaking, although, when excluded, the young have all the appearance of an egg, yet they are alive, and without throwing off any shell, stir and move about with great vivacity; so that this animal may properly be said to be viviparous. The little worms at first seem scarce able to stir; but they soon feed, and become very brisk. These animals are of great use in medicine: being impregnated with a saline quality, which is diuretic and stimulating. Of this insect, Linnæus makes three species.

CHAPTER VIII.

OF THE MONOCULUS; OR ARBORESCENT WATER-FLEA.

THIS animal, which is of the size of a flea, appears to the sight, unassisted by the microscope, to have but one eye; for the eyes, by reason of the smallness of the head, seem to be joined to each other: they are situated in the trunk of this insect, and the beak is likewise very small and sharp-pointed. The structure of the eye is seen by the microscope to be reticulated, or made like a net; and the trunk of this insect, by which it feeds, is not only small and sharp, but also transparent. The insects are of a blood red colour; and sometimes are seen in such multitudes on the surface of standing water, as to make them appear all over red, whence many fanciful people have thought the water to be turned into blood.

Swammerdam tells us of a celebrated professor of Leyden, who was at first astonished by an appearance of this kind.—Being once intent upon his studies, he heard a noise, of which, as it increased by degrees, he was desirous to know the cause. The maid-servant attending to his summons, appeared quite petrified with fear, and told him with a tremulous voice, that all the waters of Leyden were turned into blood! Upon this he went directly, in a small bark, to the place where the water was thus changed, and put some of the bloody water into a glass; but upon viewing it with attention, he observed that it abounded with infinite numbers of these little red insects, which tinged the whole body of the fluid with that seemingly formidable colour.—Thus his sudden fright was changed into lasting admiration.

Of all parts of this animal, its branching arms and the motion it makes with them in the water, deserve our greatest attention. By these the little creature can move in a straight line; waving its arms, as a bird does its wings in the air, sometimes upward, sometimes downward, sometimes to the right, sometimes to the left, yet still continuing to proceed in a right line. By striking the water with its arms, it can ascend with great velo city; and by striking in a contrary direction, it dives with equal ease As these motions are very rapid, the little animal appears to jump in the water, its head always tending to the surface, and its tail stretched downward. This insect is produced from an egg, which, when excluded, is carried on the back of the female, and soon is seen floating in the water round her Its appearance at first is that of a very small whitish insect, endued with a very nimble motion. Except in colour, it suffers no change, only continuing to grow larger and redder, as it grows old. They sometimes remain several days on the surface of the water; and sometimes are seen at the bottom only; but they are never at rest. They change their skin, like most other insects; and the cast skin resembles the insect itself so exactly, that one might mistake the mask for the animal.

CHAPTER IX.

OF THE SCORPION AND ITS VARIETIES.

THERE is scarce an insect without wings that is not obnoxious to man: the smallest have the power of annoying him, either by biting or stinging him; and though each is in itself contemptible, they become formidable from their numbers. But of all this class there is none so terrible as the scorpion, whose shape is hideous, whose size among the insect tribe is enormous, and whose sting is generally fatal. Happy for England the scorpion is entirely a stranger among us! In several parts of the continent of Europe it is but too well known, though it seldom grows above four inches long: but in the warm tropical climates, it is seen a foot in length, and in every respect as large as a lobster.

The scorpion is one of the largest of the insect tribe, and not less terrible from its size than its malignity. It resembles a lobster somewhat in shape but is infinitely more hideous. There have been enumerated nine different kinds of this dangerous insect, chiefly distinguished by their colour, there being scorpions yellow, brown, and ash-coloured; others that are the colour of rusty iron, green, pale yellow, black, claret-colour, white, and gray.

There are four principal parts distinguishable in this animal; the head, the breast, the belly, and the tail. The scorpion's head seems, as it were, jointed to the breast; in the middle are seen two eyes; and a little more forward two eyes more, placed in the fore-part of the head: these eyes are so small that they are scarcely perceivable; and it is probable the animal has but little occasion for seeing. The mouth is furnished with two jaws; the undermost is divided into two, and the parts notched into each other, which serves the animal as teeth, and with which it breaks its food, and thrusts it into its mouth: these the scorpion can at pleasure pull back into its mouth, so that no part of them can be seen. On each side of the head are two arms, each composed of four joints; the last of which is large, with strong muscles, and made in the manner of a lobster's claw. Below the breast are eight articulated legs, each divided into six joints; the two hindmost of which are each provided with two crooked claws, and here and there covered with hair. The belly is divided into seven little rings; from the lowest of which is continued a tail composed of six joints, which are bristly and formed like little globes, the last being armed with a crooked sting. This is that fatal instrument which renders this insect so formidable: it is long, pointed, hard, and hollow; it is pierced near the base by two small holes, through which when the animal stings, it ejects a drop of poison, which is white, caustic, and fatal. The reservoir in which this poison is kept, is in a small bladder near the tail, into which the venom is distilled by a peculiar apparatus. If this bladder be gently pressed, the venom will be seen issuing out through the two holes above mentioned; so that it appears, that when the animal stings, the bladder is pressed, and the venom issues through the two apertures into the wound.

There are few animals more formidable, or more truly mischievous than the scorpion. As it takes refuge in a small place, and is generally found sheltering in houses, so it cannot be otherwise than that it must frequently sting those among whom it resides. In some of the towns of Italy, and in France, in the province of Languedoc, it is one of the greatest pests that torment mankind: but its malignity in Europe is trifling, when compared to what the natives of Africa and the east are known to experience. In Batavia where they grow twelve inches long, there is no removing any piece of furniture without the utmost danger of being stung by them. Bosman assures us, that, along the Gold Coast, they are often found larger than a lobster; and that their sting is inevitably fatal. In Europe however, they are by no means so large, so venomous, or so plentiful. The general size of this animal does not exceed two or three inches; and its sting is very seldom found to be fatal. Maupertuis, who made several experiments on the scorpion of Languedoc, found it by no means so invariably dangerous as had till then been represented. He provoked one of them to sting a dog, in three places of the belly, where the animal was without hair: in about an hour after the poor animal seemed greatly swollen, and became very sick; he then cast up whatever he had in his bowels; and for about three hours continued vomiting a whitish liquid. The belly was always greatly swollen, when the animal began to vomit; but this operation always seemed to abate the swelling; which alternately swelled, and was thus emptied for three hours successively.—The poor animal, after this, fell into convulsions, bit the ground, dragged himself along upon his fore-feet, and at last died, five hours after being bitten. He was not partially swollen round the place which was bitten, as is usual after the sting of a wasp or a bee; but his whole body was inflated, and there only appeared a red spot on the places where he had been stung.

Some days after, however, the same experiment was tried upon another dog, and even with more aggravated cruelty; yet the dog seemed no way affected by the wounds, but howling a little when he received them, continued alert and well after them; and soon after was set at liberty, without showing the smallest symptoms of pain. So far was this poor creature from being terrified at the experiment, that he left his own master's house, to come to that of the philosopher, where he had received more plentiful entertainment. The same experiment was tried by fresh scorpions, upon seven other dogs, and upon three hens; but not the smallest deadly symptoms were seen to ensue. From hence it appears that many circumstances, which are utterly unknown, must contribute to give efficacy to the scorpion's venom. Whether its food, long fasting, the season, the nature of the vessels it wounds, or its state of maturity, contribute to, or retard its malignity, is yet to be ascertained by succeding experiment. In the trials made by our philosopher, he employed scorpions of both sexes newly caught, and seemingly vigorous and active. The success of this experiment may serve to show, that many of those boasted antidotes which are given for the cure of the scorpion's sting, owe their success rather to accident than their own efficacy. They only happen to cure when their sting was no way dangerous; but in cases of actual malignity, they might probably be utterly unserviceable.

The scorpion of the tropical climates being much larger than the former, is probably much more venomous. Helbigius, however, who resided for many years in the East, assures us that he was often stung by the scorpion, and never received any material injury from the wound: a painful tumour generally ensued, but he always cured it, by rubbing the part with a piece of iron or stone, as he had seen the Indians practise before him, until the flesh became insensible. Seba, Moore, and Bosman, however, give a very different account of the Scorpion's malignity: and assert that, unless speedily releived, the wound becomes fatal.

It is certain that no animal in the creation seems endued with such an irascible nature. I have often seen them taken and put into a place of security, exerting all their rage against the sides of the glass vessel that contained them. I have seen them attempt to sting a stick, when put near them; and attack a mouse or a frog, while those animals were far from offering any injury. Maupertuis put three scorpions and a mouse into the same vessel together, and they soon stung the little animal in different places. The mouse, thus assaulted, stood for some time upon the defensive, and at last killed them all, one after another. He tried this experiment in order to see whether the mouse after it had killed would eat the scorpions; but the little quadruped seemed entirely satisfied with the victory, and even survived the severity of the wounds it had received: Wolkamer tried the courage of the scorpion against the large spider, and inclosed several of both kinds in a glass vessel for that purpose.* The success of this combat was very remarkable. The spider at first used all its efforts to immesh the scorpion in its web, which it immediately began spinning; but the scorpion rescued itself from the danger, by stinging its adversary to death; it soon after cut off with its claws, all the legs of the spider, and then sucked all the internal parts at its leisure. If the scorpion's skin had not been so hard, Wolkmar is of opinion that the spider would have obtained the victory; for he had often seen one of these spiders destroy a toad.

The fierce spirit of this animal is equally dangerous to its own species; for scorpions are the cruellest enemies to each other. Maupertuis put about a hundred of them together in the same glass; and they scarce came into contact, when they began to exert all their rage in mutual destruction: there was nothing to be seen but one universal carnage, without any distinction of age or sex; so that in a few days there remained only fourteen, which had killed and devoured all the rest.

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* Ephemerides Dec. II 1687 Observ. 234

But their unnatural malignity is still more apparent in their cruelty to their offspring. He enclosed a female scorpion, big with young, in a glass vessel, and she was seen to devour them as fast as they were excluded: there was but one only of the number that escaped the general destruction, by taking refuge on the back of its parent; and this soon after revenged the cause of its brethren by killing the old one in its turn.

Such is the terrible and unrelenting nature of this insect, which neither the bonds of society, nor of Nature can reclaim: it is even asserted that, when driven to an extremity, the scorpion will often destroy itself. The following experiment was ineffectually tried by Maupertuis: but I am so well assured of it by many eye-witnesses, who have seen it both in Italy and America, that I have no doubt remaining of its veracity. A scorpion, newly caught, is placed in the midst of a circle of burning charcoal, and thus an egress prevented on every side: the scorpion, as I am assured, runs for about a minute round the circle, in hopes of escaping; but finding that impossible, it stings itself on the back of the head, and in this manner the undaunted suicide instantly expires.

It is happy for mankind that these animals are thus destructive to each other; since otherwise they would multiply in so great a degree as to render some countries uninhabitable. The male and female of this insect are very easily distinguishable; The male being smaller and less hairy. The female brings forth her young alive, and perfect in their kind. Rhedi having bought a quantity of scorpions, selected the females, which by their size and roughness were easily distinguishable from the rest, and putting them in separate glass vessels, he kept them for some days without food. In about five days one of them brought forth thirty-eight young ones, well shaped, and of a milk-white colour, which changed every day more and more, into a dark rusty hue. Another female, in a different vessel, brought forth twenty-seven of the same colour: and the day following the young ones seemed all fixed to the back and belly of the female. For near a fortnight all these continued alive and well; but afterwards some of them died daily: until, in about a month, they all died except two.

Were it worth the trouble, these animals might be kept living as long as curiosity should think proper. Their chief food is worms and insects; and upon a proper supply of these, their lives might be lengthened to their natural extent. How long that may be, we are not told; but if we may argue from analogy, it cannot be less than seven or eight years; and perhaps, in the larger kind, double that duration. As they have somewhat the form of the lobster, so they resemble that animal in casting their shell, or more properly their skin; since it is softer by far than the covering of the lobster, and set with hairs, which grow from it in great abundance, particularly at the joinings. The young lie in the womb of the parent, each covered up in its own membrane, to the number of forty or fifty, and united to each other by an oblong thread, so as to exhibit altogether the form of a chaplet.

Such is the manner in which the common scorpion produces its young; but there is a scorpion of America, produced from the egg, in the manner of the spider. The eggs are no larger than pin-points; and they are deposited in a web, which they spin from their bodies, and carry about with them till they are hatched. As soon as the young ones are excluded from the shell, they get upon the back of the parent, who turns her tail over them, and defends them with her sting. It seems probable, therefore, that captivity produces that unnatural disposition in the scorpion, which induces it to destroy its young; since, at liberty, it is found to protect them with such unceasing assiduity.

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CHAPTER X.

OF THE SCOLOPENDRA AND GALLY-WORM.

Of these hideous and angry insects we know little, except the figure and the noxious qualities. Though with us there are insects somewhat resembling them in form, we are placed at a happy distance from such as are really formidable. With us they seldom grow above an inch long; in the tropical climates they are often found above a quarter of a yard.

The Scolopendra is otherwise called the Centipes, from the number of its feet; and it is very common in many parts of the world, especially between the tropics. Those of the East Indies, where they grow to the largest size, are about six inches long, of a ruddy colour, and as thick as a man's finger: they consist of many joints; and from each joint is a leg on each side: they are covered with hair, and seem to have no eyes; but there are two feelers on the head, which they make use of to find out the way they are to pass: the head is very round, with two small sharp teeth, with which they inflict wounds that are very painful and dangerous. A sailor that was bit by one on board a ship, felt an excessive pain, and his life was supposed to be in danger: however, he recovered by the application of three roasted onions to the part, and was soon quite well. Of this animal there are different kinds; some living, like worms, in holes, in the earth; others under stones, and among rotten wood: so that nothing is more dangerous than removing those substances, in the places where they breed.

The Gally-worm differs from the scolopendra, in having double the number of feet; there being two on each side, to every joint of the body. Some of these are smooth, and others hairy; some are yellow, some black, and some brown. They are found among decayed trees, between the wood and the bark; as also among stones that are covered with moss. They all, when touched, contract themselves, rolling themselves up like a ball. Whatever may be their qualities in the tropical parts of the world, in Europe they are perfectly harmless; having been often handled and irritated, without any vindictive consequences.

All these, as well as the scorpion, are supposed to be produced perfect from the parent, or the egg; and to undergo no changes, after their first exclusion. They are seen of all sizes; and this is a sufficient inducement to suppose, that they preserve their first appearance, through the whole of their existence. It is probable, however, that like most of this class, they often change their skins; but of this we have no certain information.

CHAPTER IX.

OF THE LEECH.

The last of this wingless tribe that I shall mention is the Leech, which, like all the former, undergoes no varieties of transformation; but when once excluded from the body of the parent, preserves its first figure to the end. I place the history of the leech among the first class of animals; while I have degraded the Earth-worm, the Tænia, and the Polypus, into the class of zoophytes, or that imperfect tribe which serves to make the shade between animal and vegetable Nature. Not but that the earth-worm or the polypus have their motions, their appetites, and their vital principles, as complete as the leech, and, to a cursory view, appear every way as complete animals. But there is one circumstance that lays the line between them; that exalts the one and degrades the other. The earth-worm and the polypus may be cut into two pieces, and each piece will produce a new and perfect animal: the leach cannot suffer this dissection, but dies when cut in two; an evident instance that it is possessed of a more perfect organization than those animals which it otherwise very much resembles.

The leech, from its uses in medicine, is one of those insects which man has taken care to provide; but of a great variety, one kind only is considered as servicable. The horse leech which is the largest of all, and grows to four inches in length, with a glossy, black surface, is of no use, as it will not stick to the skin; the snail-leech is but an inch in length; and though it will stick, is not large enough to extract a sufficient quantity of blood from the patient; the broad-tailed leech, which grows to an inch and a half in length, with the back raised into a sort of ridge, will stick but on very few occasions: it is the large brown leech, with a whitish belly, that is made use of in medicine, and whose history best merits our curiosity.

The leech has the general figure of the worm, and is about as long as one's middle finger. Its skin is composed of rings, by means of which it is possessed of its agility, and swims in water. It contracts itself, when out of water, in such a manner, that when touched it is not above an inch long.—It has a small head and black skin, edged with a yellow line on each side, with some yellowish spots on the back. The belly also, which is of a reddish colour, is marked with whitish yellow spots. But the most remarkable part of this animal is the mouth, which is composed of two lips, that take whatever form the insect finds convenient. When at rest, the opening is usually triangular; and within it are placed three very sharp teeth, capable of piercing not only the human skin, but also that of a horse or an ox. Still deeper in the head is discovered the tongue, which is composed of a strong fleshy substance, and which serves to assist the animal in sucking, when it has inflicted its triple wound; for no sooner is this voracious creature applied to the skin, than it buries its teeth therein, then closes its lips round the wound which it has made; and thus in the manner of a cupping-glass, extracts the blood as it flows to the different orifices.

In examining this animal's form farther towards the tail, it is seen to have a gullet and an intestinal canal, into which the blood flows in great abundance. On each side of this are seen running along several little bladders, which, when the animal is empty, seem to be filled with nothing but water; but when it is gorging blood, they seem to communicate with the intestines, and receive a large portion of the blood which flows into the body. If these bladders should be considered as so many stomachs, then every leech will be found to have twenty-four. But what is most extraordinary of all in this animal's formation is, that though it takes so large a quantity of food it has no anus or passage to eject it from the body when it has been digested. On the contrary, the blood which the leech has thus sucked, remains for several months clotted within its body, blackened a little by the change, but no way putrefied, and very little altered in its texture or consistence. In what manner it passes though the animal's body, or how it contributes to its nourishment, is not easily accounted for. The water in which they are kept is very little discoloured by their continuance; they cannot be supposed to return the blood by the same passage through which it was taken in; it only remains, therefore, that it goes off through the pores of the body, and that these are sufficiently large to permit its exclusion.

But it is not in this instance alone that the leech differs from all other insects. It was remarked in a former chapter, that the whole insect tribe, had the opening into their lungs placed in their sides, and that they breathed through those apertures as other animals through the mouth. A drop of oil poured on the sides of a wasp, a bee, or a worm, would quickly suffocate them, by stopping up the passages through which they breathe; but it is otherwise with the leech, for this animal may be immersed in oil without injury; nay, it will live therein; and the only damage it will sustain is, that, when taken out, it will be seen to cast a fine pellucid skin exactly of the shape of the animal, after which it is as alert and vigorous as before. It appears from hence that the leech breathes through the mouth; and, in fact, it has a motion that seems to resemble the act of respiration in more perfect animals; but concerning all this we are very much in the dark.

This animal seems to differ from all others in several respects: the rest of the reptile tribe are brought forth from eggs: the leech is viviparous, and produces its young one after the other, to the number of forty or fifty at a birth. It is probable, that like the snail, each insect contains the two sexes, and that it impregnates and is impregnated in the same manner. The young ones are chiefly found in the month of July, in shallow running waters, and particularly where they are tepified by the rays of the sun. The large ones are chiefly sought after; and being put into a glass vessel filled with water, they remain for months, nay for years, without taking any other subsistence. But they never breed in this confinement; and, consequently, what regards that part of their history still remains obscure.

In this part of the world they seldom grow to above four inches; but in America and the East they are found from six to seven. Their pools there abound with them in such numbers, that it would be dangerous bathing there, if for no other consideration. Our sailors aud soldiers, who the last war, were obliged to walk in those countries through marshy grounds, talk with terror of the number of leeches that infested them on their march. Even in some parts of Europe they increase so as to become formidable. Sedelius, a German physician, relates, that a girl of nine years old, who was keeping sheep near the city of Bomst in Poland, perceiving a soldier making up to her, went to hide herself in a neighbouring marsh among some bushes; but the number of leeches was so great in that place, and they stuck to her so close, that the poor creature expired from the quantity of blood which she lost by their united efforts. Nor is this much to be wondered at, since one of those insects that, when empty, generally weighs but a scruple, will, when gorged, weigh more than two drachms.

When leeches are to be applied, the best way is to take them from the water in which they are contained, about an hour before, for they thus become more voracious and fasten more readily. When saturated with blood, they generally fall off of themselves; but if it be thought necessary to take them from the wound, care should be used to pull them very gently, or even to sprinkle them with salt if they continue to adhere: for if they be plucked rudely away, it most frequently happens that they leave their teeth in the wound, which makes a very troublesome inflammation, and is often attended with danger. If they be slow in fixing to the part, they are often enticed by rubbing it with milk or blood, or water mixed with sugar. As salt is a poison to most insects, many people throw it upon the leech when it has dropped from the wound, by which means it disgorges the blood it has swallowed, and it is then kept for repeated application. They seldom, however, stick after this operation; and as the price is but small, fresh leeches should always be applied whenever such an application is thought necessary.

BOOK II.

INSECTS OF THE SECOND ORDER.

CHAPTER I.

OF THE SECOND ORDER OF INSECTS IN GENERAL.

In the former part we gave a concise history of the most considerable insects that, without wings, were produced in a perfect state; either from the body of the parent alive, like quadrupeds, or from the egg, in the manner of birds. We now come to a second order of insects, that are produced from the egg, like the former, but not in a perfect state; for when first excluded, they are without wings. This, however, does not hinder the exercise of their animal functions; the insect, although not yet come to perfection, walks, leaps, and eats; nor is it ever deprived of motion, only that it rests a little when it is about to cast that part of its skin previous to its state of perfection. It is then seen to assume two wings, which, like a budding flower, burst through the case that contained them, and the animal becomes a winged insect in its state of highest perfection. To this order we may refer the Libella, or Dragon-Fy; the Formica Leo, or Lion-Ant; the Grasshopper: the Locust; the Cricket; the Wood-Cricket; the Mole-Cricket; the Flea-Locust; the Flying-Bug; the Tipula; the Water-Scorpion; the Notonecta, or Water-Fly, and many others.

CHAPTER II.

OF THE LIBELLA, OR DRAGON FLY.

OF all the flies which adorn or diversify the face of Nature, these are the most various and the most beautiful; they are of all colours; green, blue, crimson, scarlet, white; some unite a variety of the most vivid tints, and exhibit in one animal more different shades than are to be found in the rainbow. They are called in different parts of the kingdom, by different names; but none can be at a loss to know them, as they are distinguished from all other flies by the length of their bodies, by the largeness of their eyes, and the beautiful transparency of their wings, which are four in number. They are seen in summer flying with great rapidity near every hedge, and by every running brook; they sometimes settle on the leaves of plants, and sometimes keep for hours together on the wing.

Dragon-flies, though there are three or four different kinds, yet agree in the most striking parts of their history, and one account may serve for all. The largest sort are generally found from two to three inches long; their tail is forked; the body divided into eleven rings; Their eyes are large, horny, and transparent, divided by a number of intersections; and their wings that always lie flat when they are at rest, are of a beautiful glossy transparency: sometimes shining like silver, and sometimes glistening like gold. Within the mouth are to be seen two teeth covered with a beautiful lip: with these the creatures bite fiercely when they are taken; but their bite is perfectly harmless, as I have experienced more than once.

These insects, beautiful as they are, are produced from eggs, which are deposited in the water, where they remain for some time without seeming life or motion. They are ejected by the female into the water, in clusters, like a bunch of grapes, where they sink to the bottom by their natural weight, and continue in that state till the young ones find strength enough to break the shell, and to separate from each other. The form in which they first show life, is that of a worm with six legs, bearing a strong resemblance to the dragon-fly in its winged state, except that the wings are yet concealed within a sheath peculiar to this animal. The rudiments of those appear in bunches on the back, within which the wings are folded up into each other, while all the colours and varieties of painting appear transparent through the skin. These animals, upon quitting the egg, still continue in the water, where they creep and swim, but do not move swiftly. They have likewise a sharp sight, and immediately sink to the bottom, if any one comes to the places wherein they live, or whenever they perceive the least uncommon object. Their food at that time is soft mud, and the glutinous earthy substances that are found at the bottom.

When these animals prepare to change from their reptile to their flying state, they then move out of the water to a dry place; as into grass; to pieces of wood, stone, or any thing else they meet with. They there firmly fix their acute claws; and, for a short time, continue quite immoveable, as if meditating on the change they are to undergo. It is then observed, that the skin first opens on the head and back; and out of this opening they exhibit their real head and eyes, and and at length their six legs; whilst, in the mean time, the hollow and empty skin, or slough of their legs remains firmly fixed in its place. After this, the enclosed creature creeps forward by degrees; and by this means draws first its wings and then its body out of the skin; and proceeding a little farther, sits at rest for some time, as if immoveable. During this time, the wings, which were moist and folded, begin by degrees to expand themselves, and to make smooth and even all those plaits which were laid against each other, like a closed fan. The body is likewise insensibly extended, until all the limbs have obtained their proper size and dimensions. All these surprising and difficult operations are accomplished by the force of the blood and the circulating humours. The creature cannot at first make use of its new wings, and therefore is forced to stay in the same place until all its limbs are dried up by the circumambient air. It soon, however, begins to enter upon a more noble life than it had hitherto led in the bottom of the brook; and from creeping slowly and living accidentally, it now wings the air, and makes choice from amidst the variety of its provisions.

Indeed, no animal is more amply fitted for motion, subsistence, and enjoyment. As it haunts and seeks after its food flying in the air, Nature has provided it with two large eyes, which make almost the whole head, and which resemble glittering mother-of-pearl. It has also four expansive silver-coloured wings, with which, as with oars, it can turn itself with prodigious velocity; and to assist these, it is furnished with a very long body, which, like a rudder, directs its motions. As the wings are long, and the legs short, they seldom walk, but are ever seen either resting or flying. For this reason, they always choose dry branches of trees or shrubs to remain on; and when they have refreshed themselves a little, they renew their flight. Thus they are seen adorning the summer with a profusion of beauty, lightly traversing the air in a thousand directions, and expanding the most beautiful colours to the sun. The garden, the forest, the hedges, and the rivulets, are animated by their sports; and there are few who have been brought up in the country, who have not employed a part of their childhood in the pursuit.

But while these beautiful flies appear to us so idly and innocently employed, they are in fact the greatest tyrants of the insect tribe; and, like the hawk among birds, are only hovering up and down to seise their prey. They are the strongest and the most courageous of all winged insects; nor is there one, how large soever, that they will not attack and devour. The blue-fly, the bee, the wasp, and the hornet, make their constant prey; and even the butterfly, that spreads so large a wing, is often caught and treated without mercy. Their appetite seems to know no bounds; they spend the whole day in the pursuit, and have been seen to devour three times their own size in the capture of a single hour. They seise their prey flying with their six claws, and tear it easily to pieces with their teeth, which are capable of inflicting troublesome wounds.

But the males are upon the wing for another purpose beside that of food, as they are very salacious, and seek the females with great ardour. The sun no sooner begins to warm the fields, than the males are found assiduously employed each in seeking its mate; and no sooner does a female appear but two or three males are seen pursuing and endeavouring to seise her with all their arts and agility. The instrument of generation in the male is placed very different from that of any other insect, being not at the end of the tail as in others, but immediately under the breast, and consequently, at first view, incapable of being united to the sexual part of the female; which, as in other insects, lies in the tail. To perform this junction, Nature has provided the male with a very peculiar manner of proceeding. As soon as he perceives the female, and finds himself sufficiently near, he seizes upon the back of her head by surprise, and fastening his claws upon her, turns round his forky tail, which he fastens round her neck, and in this manner fixes himself so closely and firmly, that no efforts can remove him. It is in vain that she flies from one branch to another, and settles upon them, he still keeps fixed, and often continues in this situation for three or four hours successively. When he flies, she is obliged to fly with him; but he still directs the way: and though she moves her wings, she seems entirely guided by his motions. As yet, however, the business of impregnation is not yet performed; for to this the female must contribute; and she at last seems, by the continuance of her constraint to comply; for, turning up the end of her tail to that part of the breast of the male in which lies the part proper for generation, both instruments meet, and the eggs of the female receive the necessary fecundation. An hour or two after this, she flies to some neighbouring pool, where she deposits her eggs as was already mentioned There they continue in a reptile state for a year and then are changed into a beautiful fly, resembling the parent.

CHAPTER III.

OF THE FORMICA LEO, OR LION-ANT.

ALTHOUGH this animal properly belongs to no order of insects, yet as it is changed into a fly very much resembling that described in the preceding chapter, it may not be improper to give its history here. If we consider the life of this animal, in its different stages of existence, we shall find it equally wonderful in all; but as it changes to a dragon-fly, what we have said of that animal above, need not be repeated here. The lion-ant, when it becomes an inhabitant of air, in every respect resembles that which has been already described; its glossy wings, its voracious appetites, its peculiar manner of generation, are entirely the same. It is in its reptile state that it differs from all other insects; and in that state it will be amusing to pursue its history.

The lion-ant in its reptile state, is of the size of a common wood-louse, but somewhat broader. It has a pretty long head and a roundish body, which becomes a little narrower towards the tail. The colour is a dirty grey, speckled with black, and the body is composed of several flat rings, which slip one upon another. It has six feet, four of which are fixed to the breast, and two to the neck. The head is small and flat, and before there are two little smooth horns or feelers, which are hard, about a quarter of an inch long, and crooked at the ends. At the basis of the feelers there are two small black lively eyes, by which it can see the smallest object, as is easily discovered by its starting from every thing that approaches.

To a form so unpromising, and so ill provided for the purposes of rapacity, this animal unites the most ravenous appetites in Nature; but to mark its imbecility still stronger, as other animals have wings or feet to enable them to advance towards their prey, the lion-ant is unprovided with such assistance from either. It has legs, indeed; but these only enable it to run backward, so that it could as soon die as make the smallest progressive motion. Thus famished and rapacious as it ever seems, its prey must come to it, or rather to the snare provided for it, or the insidious assassin must starve.

But Nature that has denied it strength or swiftness, has given it an equivalent in cunning, so that no animal fares more sumptuously, without ever stirring from its retreat. For this purpose, it chooses a dry sandy place at the foot of a wall, or under some shelter, in order to preserve its machinations from the rain. The driest and most sandy spot is the most proper for it; because a heavy clogged earth would defeat its labour. When it goes about to dig the hole where it takes its prey, it begins to bend the hinder part of its body, which is pointed, and thus works backward; making, after several attempts, a circular furrow, which serves to mark out the size of the hole it intends making, as the ancients marked out the limits of a city with a plough. Within this first furrow it digs a second, then a third, and afterwards others, which are always less than the preceding. Then it begins to deepen its hole, sinking lower and lower into the sand, which it throws with its horns or feelers towards the edges, as we see men throw up sand in a gravel-pit. Thus, by repeating its labours all round, the sand is thrown up in a circle about the edges of the pit, until the whole is quite completed. This hole is always formed in a perfect circle; and the pit itself resembles the inside of an inverted funnel. When this insect first leaves the egg and is newly hatched, the first pit it makes is very small; but as it grows bigger, it makes a larger hole; which is destined like a pit-fall, to entrap its prey. It is generally about two inches deep, and as much in diameter.

The work being thus, with great labour, finished, the insidious insect places itself in ambush, hiding itself at the bottom, under the sand, in such a manner, that its two horns encircle the bottom of the pit. All the sides of this pit fall are made of the most loose and crumbling materials; so that scarce any insect can climb up that has once got down to the bottom. Conscious of this, the lion-ant remains in patient expectation, ready to profit by that accident which throws some heedless little animal into its den. If then, by misfortune, an ant, a wood-louse, or a small caterpillar walks too near the edge of the precipice, the sand gives way beneath them, and they fall to the bottom of the pit, where they meet inevitable destruction. The fall of a single grain of sand gives the murderer notice at the bottom of its cave; and it never fails to sally forth to seize upon its prey. It happens sometimes, however, that the ant or the wood-louse, is too nimble, and runs up the sides of the pit-fall before the other can make ready to seize it. The lion-ant has then another contrivance, still more wonderful than the former; for, by means of its broad head and feelers, it has a method of throwing up a shower of sand which falls upon the struggling captive with tremendous weight, and once more crushes it down to the bottom. When the insect is once fallen thus low, no efforts can retrieve or release it; the lion-ant seizes it with its feelers, which are hollow, and darting them both into its body, sucks out all the little animal's juices with the utmost rapacity.

When the prey is thus reduced to a husk, and nothing but the external form remains, the next care of the murderer is to remove the body from its cell; since the appearance of dead carcasses might forewarn other insects of the danger of the place. The insect, therefore, takes up the wasted trunk with its feelers, and throws it with wonderful strength, at least six inches from the edge of its hole; and then patiently sets about mending the breaches which its fortification had received in the last engagement. Nothing can abate its industry, its vigilance, its patience, or its rapacity. It will work for a week together to make its pit fall; it will continue upon the watch for more than a month, patiently expecting the approach of its prey; and if it comes in greater quantities than is needful, yet still the little voracious creature will quit the insect it has newly killed, and leave it half eaten, to kill and attack any other that happens to fall in the sphere of its malignity; though so voracious, it is surprisingly patient of hunger; some of them having been kept in a box with sand, for six months and upwards, without feeding at all.

When the lion-ant attains a certain age, in which it is to change into another form, it then leaves off its usual rapacious habits, but keeps on its industry. It no longer continues to make pits, but furrows up the sand all round in an irregular manner; testifying those workings and violent agitations which most insects exhibit previous to their transformation. These animals are produced in autumn, and generally live a year, and perhaps two, before they assume a winged form. Certain it is, that they are found at the end of winter of all sizes; and it would seem that many of the smaller kinds had not yet attained sufficient maturity for transformation. Be this as it may, when the time of change approaches, if the insect finds its little cell convenient, it seeks no other; if it is obliged to remove, after furrowing up the sand, it hides itself under it, horns and all. It there spins a thread in the manner of the spider; which being made of a glutinous substance, and being humid from the moisture of the body, sticks to the little particles of sand among which it is spun; and in proportion as it is thus excluded, the insect rolls up its web, sand and all, into a ball, of which itself is the centre. This ball is about half an inch in diameter; and within it the insect resides, in an apartment sufficiently spacious for all its motions. The outside is composed of sand and silk; the inside is lined with silk only, of a fine pearl-colour, extremely delicate, and perfectly beautiful. But though the work is so curious within, it exhibits nothing to external appearance, but a lump of sand; and thus escapes the search of birds that might otherwise disturb the inhabitant within.

The insect thus continues shut up for six weeks or two months; and gradually parts with its eyes, its feelers, its feet, and its skin; all which are thrust into a corner of the inner apartment like a rag. The insect then appears almost in its winged state, except that there is a thin skin which wraps up the wings, and that appears to be nothing else but a liquor dried on their outside. Still, however, the little animal is too delicate and tender to venture from its retreat; but continues inclosed for some time longer: at length, when the members of this new insect have acquired the necessary consistence and vigour, it tears open its lodging, and breaks through its wall. For this purpose it has two teeth like grasshoppers, with which it eats through and enlarges the opening, till it gets out. Its body, which is turned like a screw, takes up no more than the space of a quarter of an inch; but when it is unfolded, it becomes half an inch in length; while its wings, that seemed to occupy the smallest space, in two minutes time unfold, and become longer than the body. In short, it becomes a large and beautiful fly, of the libellula kind, with a long, slender body, of a brown colour: a small head, with large bright eyes, long, slender legs, and four large, transparent reticulated wings. The rest of its habits resemble that insect whose form it bears; except,

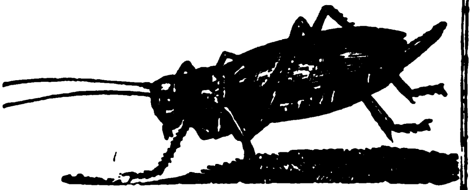
Drone Bee p. 174.

House Cricket, p. 145.

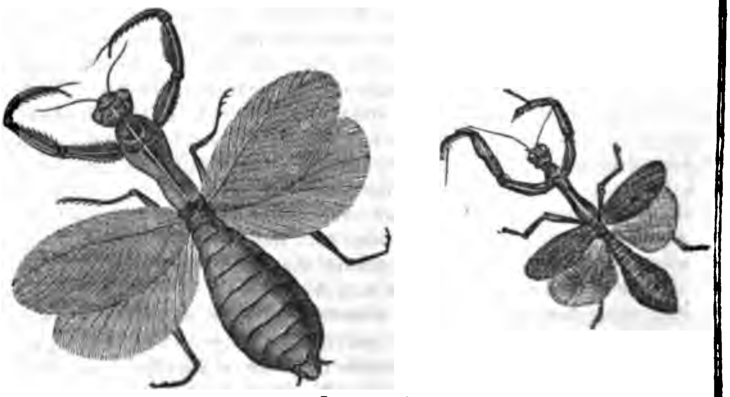
Queen Bee, p. 174.

Dragon-Fly, p. 133.

Common Bee, p. 174.



Grasshopper, p. 139.



Locusts, p. 75.

To face p. 139, vol. iv

that instead of dropping its eggs in the water, it deposits them in sand, where they are soon hatched into that rapacious insect so justly admired for its method of catching its prey.

CHAPTER IV.

OF THE GRASSHOPPER, THE LOCUST, THE CICADA, THE CRICKET, AND THE MOLE-CRICKET.

BELONGING to the second order of insects we find a tribe of little animals, which, though differing in size and colour, strongly resemble each other in figure, appetites, nature, and transformation. But though they all appear of one family, yet men have been taught to hold them in different estimation; for while some of this tribe amuse him with their chirpings, and banish solitude from the fields, others come in swarms, eat up every thing that is green, and in a single night convert the most delightful landscape into a dreary waste. However, if those animals be separately considered, the devouring locust is not in the least more mischievous than the musical grasshopper; the only difference is, that one species come for food in a swarm, the others feed singly.

That animal which is called the grasshopper with us, differs greatly from the cicada of antiquity; for as our insect is active enough in hopping through the long grass, from whence it has taken its name, the cicada had not this power, but either walked or flew. The little hissing note also of our grasshopper is very different from the song of the cicada which was louder and far more musical. The manner in which this note is produced by the two animals is very different; for the cicada makes it by a kind of buckler, which the male has beneath its belly; the grasshopper by a transparent membrane that covers a hole in the base of its wings. There is still a greater variety in all these with regard to shape and colour. Some are green, some black, some livid and some variegated; but many of them do not show all their colours till they fly. Some have long legs, some short, some with more joints, others with fewer. Some sing, others are mute; some are innocent, doing no damage to the husbandman; while others do such prodigious mischief, that they are looked upon in some countries as one of the terrible scourges of an incensed Divinity.

Of this variegated tribe, the little grasshopper that breeds in such plenty in every meadow, and that continues its chirping through the summer, is best known to us; and by having its history we shall be possessed of that of all the rest. This animal is of the colour of green leaves, except a line of brown which streaks the back, and two pale lines under the belly, and behind the legs. It may be divided into the head, the corselet, and the belly. The head is oblong, regarding the earth, and bearing some resemblance to that of a horse. Its mouth is covered by a kind of round buckler, jutting over it, and armed with teeth of a brown colour, hooked at the points. Within the mouth is perceivable a large, reddish tongue, and fixed to the lower jaw. The feelers or horns are very long, tapering off to a point; and the eyes are like two black specks, a little prominent. The corselet is elevated, narrow, armed above and below by two serrated spines. The back is armed with a strong buckler, to which the muscles of the legs are firmly bound, and round these muscles are seen the vessels by which the animal breathes, as white as snow. The last pair of legs are much longer and stronger than the first two pair, fortified by thick muscles, and very well formed for leaping. It has four wings; the anterior ones springing from the second pair of legs, the posterior from the third pair. The hinder wings are much finer and more expansive than the foremost, and are the principal instruments of its flight. The belly is considerably large, composed of eight rings, and terminated by a forky tail, covered with down, like the tail of a rat. When examined internally, besides the gullet, we discover a small stomach; and behind that a very large one, wrinkled and furrowed within side: lower down there is still a third; so that it is not without reason that all the animals of this order are said to chew the cud, as they so much resemble ruminating animals in their internal conformation.

A short time after the grasshopper assumes its wings, it fills the meadow with its note; which, like that among birds is a call to courtship. The male only of this tribe is vocal; and, upon examining at the base of the wings, there will be found a little hole in its body, covered with a fine, transparent membrane. This is thought, by Linnæus, to be the instrument it employs in singing: but others are of opinion the sound is produced by rubbing its hinder legs against each other: however this be, the note of one male is seldom heard, but it is returned by another; and the two little animals, after many mutual insults of this kind, are seen to meet and fight desperately. The female is generally the reward of victory; for, after the combat, the male seizes her with his teeth behind the neck, and thus keeps her for several hours till the business of fecundation is performed. They are at that time so strongly united, that they can scarcely be separated without tearing asunder. Towards the latter end of autumn the female prepares to deposit her burden; and her body is then seen greatly distended with her eggs, which she carries to the number of one hundred and fifty. In order to make a proper lodgement in the earth for them, Nature has furnished her with an instrument at her tail, somewhat resembling a two-edged sword, which she can sheathe and unsheathe at pleasure: with this she pierces the earth as deep as she is able; and into the hole which her instrument has made, she deposits her eggs, one after the other.

Having thus provided for the continuation of her posterity, the animal herself does not long survive; but as the winter approaches, she dries up, seems to feel the effects of age, and dies from a total decay. Some, however, assert, that she is killed by the cold; and others, that she is eaten by worms: but certain it is, that neither the male nor the female are ever seen to survive the winter. In the mean time the eggs which have been deposited, continue unaltered, either by the severity of the season or the retardation of the spring. They are of an oval figure, white, and of the consistence of horn: their size nearly equals that of a grain of anise: they are enveloped in a body within a covering, branched all over with veins and arteries; and when excluded, they crack, on being pressed between the fingers; their substance within is a whitish, viscous and transparent fluid. In this manner they remain deposited beneath the surface of the earth, during the whole winter; till the genial return of spring begins to vivify and hatch them. The sun, with its warmth, beginning to animate all Nature, the insect eggs feel its benign influence; and, generally, about the beginning of May, every egg produces an insect, about the size of a flea. These, at first, are of a whitish colour; at the end of two or three days they turn black; and soon after they become of a reddish brown. They appear, from the beginning, like grasshoppers, wanting wings; and hop among the grass as soon as excluded, with great agility.

Yet still they are by no means arrived at their state of full perfection; although they bear a strong resemblance to the animal in its perfect form. They want, or seem to want, the wings, which they at last seem to assume; and can only hop among the grass, without being able to fly. The wings, however, are not wanting, but are concealed within four little bunches that seem to deform the sides of the animal: there they lie rolled up in a most curious manner; and occupying a smaller space than one would conceive who saw them extended. Indeed, all insects, whatever transmutations they may seem to undergo, are yet brought forth with those very limbs, parts, and wings, which they afterwards seem to acquire. In the most helpless caterpillar, there is still to be seen the rudiments of that beautiful plumage which it afterwards expands when a butterfly: and though many new parts seem unfolded to the view, the animal acquires none but such as it was in the beginning possessed of. The grasshopper, therefore, though seemingly without wings, is, in reality, from the first, possessed of those instruments, and only waits for sufficient force to break the bones that hold them folded up, and to give them their full expansion.

The grasshopper, that for above twenty days from its exclusion has continued without the use of its wings, which are folded up to his body, at length prepares for its emancipation, and for a life of greater liberty and pleasure. To make the proper dispositions for the approaching change, it ceases from its grassy food, and seeks about for a convenient place; beneath some thorn or thistle, that may protect it from an accidental shower. The same laborious writhings and workings, heavings and palpitations, which we have remarked in every other insect upon an approaching change, are exhibited in this. It swells up its head and neck; it then seems to draw them in again; and thus alternately, for some time, it exerts its power to get free. At length, the skin covering the head and breast is seen dividing above the neck; the head is seen issuing out first from the bursting skin; the efforts still continuing, the other parts follow successively; so that the little animal, with its long feelers, legs and all, works its way from the old skin, that remains fixed to the thistle or the thorn. It is, indeed, inconceivable, how the insect can thus extricate itself from so exact a sheath as that which covered every part of its body

The grasshopper, thus disengaged from its outer skin, appears in its perfect form; but then so feeble, and its body so soft and tender, that it may be moulded like wax. It is no longer of that obscure colour which it exhibited before, but a greenish white, which becomes more vivid as the moisture on the surface is dried away. Still, however, the animal continues to show no signs of life, but appears quite spent and fatigued with its labour for more than an hour together. During this time, the body is drying, and the wings unfolding to their greatest expansion, and the curious observer will perceive them, fold after fold, opening to the sun, till at last they become longer than the two hinder legs. The insect's body also is lengthened during this operation, and it becomes much more beautiful than before.

These insects are generally vocal in the midst of summer, and they are heard at sun-setting much louder than during the heat of the day. They are fed upon grass; and, if their belly be pressed, they will be seen to return the juices of the plants they have last fed upon. Though unwilling to fly, and slow in flight, particularly when the weather is moist or cool, they are sometimes seen to fly to considerable distances. If they are caught by one of the hinder legs, they quickly disengage themselves from it, and leave the leg behind them. This, however, does not grow again, as with crabs or spiders; for as they are animals but of a single year's continuance, they have not sufficient time for repairing those accidental misfortunes. The loss of their leg also prevents them from flying; for being unable to lift themselves in the air, they have not room upon the ground for the proper expansion of their wings. If they be handled roughly, they will bite very fiercely; and when they fly, they make a noise with their wings. They generally keep in the plain where the grass is luxuriant, and the ground rich and fertile: there they deposit their eggs particularly in those cracks which are formed by the heat of the sun.

Such are the habits and nature of those little vocal insects that swarm, in our meadows, and enliven the landscape. The larger kinds only differ from them in size, in rapidity of flight, and the powers of injuring mankind, by swarming upon the productions of the earth. The quantity of grass which a few grasshoppers that sport in the fields can destroy is trifling; but when a swarm of locusts, two or three miles long, and several yards deep, settle upon a field, the consequences are frightful. The annals of every country are marked with the devastation which such a multitude of insects produces; and though they seldom visit Europe in such dangerous swarms as formerly, yet, in some of the southern kingdoms, they are still formidable. Those which have at uncertain intervals visited Europe, in our memory, are supposed to have come from Africa, and the animal is called the great Brown Locust. It was seen in several parts of England in the year 1748, and many dreadful consequences were apprehended from its appearance. This insect is about three inches long; and has two horns or feelers, an inch in length. The head and horns are of a brownish colour; it is blue about the mouth, as also on the inside of the larger legs. The shield that covers the back is greenish; and the upper side of the body brown, spotted with black, and the under side purple. The upper wings are brown, with small dusky spots, with one larger at the tips; the under wings are more transparent, and of a light brown, tinctured with green, but there is a dark cloud of spots near the tips. This is that insect that has threatened us so often with its visitations; and that is so truly terrible in the countries where it is bred. There is no animal in the creation that multiplies so fast as these, if the sun be warm, and the soil in which their eggs are deposited be dry. Happily for us, the coldness of our climate, and the humidity of our soil, are no way favourable to their production; and as they are but the animals of a year, they visit us and perish.

The Scripture, which was written in a country where the locust made a distinguished feature in the picture of Nature, has given us several very striking images of this animal's numbers and rapacity. It compares an army where the numbers are almost infinite, to a swarm of locusts; it describes them as rising out of the earth, where they are produced; as pursuing a settled march to destroy the fruits of the earth, and co-operating with Divine indignation.

When the locusts take the field, as we are assured, they have a leader at their head, whose flight they observe, and pay a strict attention to all his motions. They appear, at a distance, like a black cloud, which, as it approaches, gathers upon the horizon, and almost hides the light of the day. It often happens that the husbandman sees this imminent calamity pass away without doing him any mischief; and the whole swarm proceed onward, to settle upon the labours of some less fortunate country. But wretched is the district upon which they settle; they ravage the meadow and the pasture ground; strip the trees of their leaves, and the garden of its beauty: the visitation of a few minutes destroys the expectation of a year; and a famine but too frequently ensues. In their native tropical climates they are not so dreadful as in the more southern parts of Europe. There, though the plain and the forest be stripped of their verdure, the power of vegetation is so great, that an interval of three or four days repairs the calamity: but our verdure is the livery of a season; and we must wait till the ensuing spring repairs the damage. Besides, in their long flights to this part of the world, they are famished by the tediousness of the journey, and are therefore more voracious whenever they happen to settle. But it is not by what they devour that they do so much damage, as by what they destroy. Their very bite is thought to contaminate the plant, and to prevent its vegetation. To use the expression of the husbandman, they burn whatever they touch; and leave the marks of their devastation for two or three years ensuing. But if they be noxious while living, they are still more so when dead; for wherever they fall, they infect the air in such a manner, that the smell is insupportable. Orosius tells us, that in the year of the world 3800, there was an incredible number of locust which infected Africa; and, after having eaten up every thing that was green, they flew off and were drowned in the African sea; where they caused such a stench, that the putrefying bodies of hundreds of thousands of men could not equal it.

In the year 1760, a cloud of locusts was seen to enter Russia in three different places; and from thence to spread themselves over Poland and Lithuania, in such astonishing multitudes, that the air was darkened, and the earth covered with their numbers. In some places they were seen lying dead, heaped upon each other four feet deep; in others they covered the surface like a black cloth: the trees bent beneath their weight; and the damage which the country sustained exceeded computation. In Barbary their numbers are formidable and their visits are frequent. In the year 1724, Dr. Shaw was a witness in that country of their devastations. Their first appearance was about the latter end of March, when the wind had been southerly for some time. In the beginning of April, their numbers were so vastly increased, that in the heat of the day they formed themselves into large swarms, which appeared like clouds, and darkened the sun. In the middle of May they began to disappear, retir ing into the plains to deposit their eggs. In the next month, being June, the young brood began to make their appearance, forming many compact bodies of several hundred yards square; and afterwards marching forward, climbed the trees, walls, and houses, eating every thing that was green in their way. The inhabitants to stop their progress, laid trenches all over their fields and gardens, filling them with water. Some placed large quantities of heath, stubble, and such like combustible matter, in rows, and set them on fire on the approach of the locusts. But all this was to no purpose; for the trenches were quickly filled up, and the fires put out by the vast number of swarms that succeeded each other. A day or two after one of these was in motion, others that were just hatched came to glean after them, gnawing off the young branches and the very bark of the trees. Having lived near a month in this manner, they arrived at their full growth, and threw off their worm-like state, by casting their skins. To prepare themselves for this change, they fixed their hinder feet to some bush or twig, or corner of a stone, when immediately, by an undulating motion used on this occasion, their heads would first appear, and soon after the rest of their bodies. The whole transformation was performed in seven or eight minutes time; after which, they were a little while in a languishing condition; but as soon as the sun and air had hardened their wings, and dried up the moisture that remained after casting off their sloughs, they returned again to their former greediness, with an addition both of strength and agility. But they did not continue long in this state before they were entirely dispersed; after laying their eggs, directing their course northward, and probably perished in the sea. It is said that the holes these animals make, to deposit their eggs in, are four feet deep in the ground; the eggs are about four score in number, of the size of caraway comfits, and bundled up together in clusters.

It would be endless to recount all the mischiefs which these famished insects have at different times occasioned; but what can have induced them to take such distant flights when they come into Europe, is not so easy to be accounted for. It seems most probable, that by means of a very dry season in the heart of Africa, they are propagated in such numbers, that the vegetables of the spot where they are produced are not sufficient to sustain them. Thus being obliged to find out other countries, they traverse the sandy deserts, where they can find no sustenance; still meeting with nothing to allure them from their height, they proceed forward across the sea, and thus come into Europe, where they alight upon the first green pastures that occur.

In some parts of the world, the inhabitants turn what seems a plague to their own advantage. Locusts are eaten by the natives in many kingdoms of the east; and are caught in small nets provided for that purpose. They parch them over the fire in an earthen pan; and when their wings and legs are fallen off, they turn reddish, of the colour of boiled shrimps. Dampier has eat them thus prepared, and thinks them a tolerable dish. The natives of Barbary also eat them fried with salt; and they are said to taste like cray-fish.

There is a locust in Tonquin, about the bigness of the top of a man's finger, and as long as the first joint. It breeds in the earth, in low grounds; and in the months of January and February, which is the season for taking them, they issue from the earth in vast swarms.—

At first they can hardly fly, so that they often fall into the rivers in great numbers: however, the natives in these months watch the rivers, and take them up in multitudes in small nets. They either eat them fresh, broiled on the coals, or pickle them for keeping. They are considered as a great delicacy in that part of the world, as well by the rich as the poor. In the countries where they are eaten, they are regularly brought to market, and sold as larks or quails in Europe. They must have been a common food with the Jews, as Moses, in the book of Leviticus, permits them to eat four different kinds of this animal, which he takes care to specify. This dish, however, has not yet made its way into the kitchens of the luxurious in Europe; and though we may admire the delicacies of the East, we are as yet happily deprived of the powers of imitation.

Of all animals, however, of this noxious tribe, the great West-Indian Locust, individually considered, is the most formidable. It is about the size of the barrel of a goose-quill, and the body is divided into nine or ten joints, in the whole about six or seven inches long. It has two small eyes, standing out of the head like those of crabs, and two feelers like long hair. The whole body is studded with small excrescences, which are not much bigger than the points of pins. The shape is roundish, and the body diminishes in circumference to the tail, which is forked into two horns. Between these, there is a sort of sheath containing a small dangerous sting. If any person happens to touch this insect, he is sure to be stung; and is immediately taken with a shivering and a trembling all over the body; which, however, may soon be put a stop to, by rubbing the place that was affected with a little palm oil.

From the locust we descend to the cricket, which is a very inoffensive and pretty animal. Though there be a species of this insect that lives entirely in the woods and fields, yet that with which we are best acquainted is the House-cricket, whose voice is so well known behind a country fire in a winter's evening. There is something so unusual in hearing a sound while we do not see the animal producing it, nor discover the place from whence it comes, that among the country people the chirping of the cricket is always held ominous; and whether it deserts the fire-side, or pays an unexpected visit, the credulous peasantry always find something to be afraid of. In general, however, the killing of a cricket is considered as a most unlucky omen: and though their company is not much desired, yet no methods must be taken to remove them.

The cricket very much resembles the grasshopper in its shape, its manner of ruminating, its voice, its leaping, and methods of propagation. It differs in its colour, which is uniformly of a rusty brown: in its food, which is more various; and in its place of residence, which is most usually in the warmest chinks behind a country hearth. They are, in some measure, obliged to the bad masonry employed in making peasants' houses for their retreats. The smallest chink serves to give them shelter; and where they once make their abode, they are sure to propagate. They are of a most chilly nature, seldom leaving the fire side; and, if undisturbed, are seen to hop from their retreats to chirrup at the blaze in the chimney. The wood-cricket is the most timorous animal in Nature; but the chimney-cricket, being used to noises, disregards not only those, but the appearance of people near it. Whether the voice of this animal is formed in the same manner with that of the grasshopper, by a fine membrane at the base of the wings, which is moved by a muscle, and which being coiled up, gives a sound like a quail-pipe, is not yet ascertained; nor do we well know the use of this voice, since anatomical inspection has not been able to discover the smallest organs of hearing. Still, how ever, we can make no doubt of their power of distinguishing sounds, though probably not in the same manner with the more perfect ranks of Nature. Certain it is, that I have often heard them call, and this call was as regularly answered by another, although none but the males are vocal.

As the cricket lives chiefly in the dark, so its eyes seem formed for the gloominess of its abode; and those who would surprise it, have only to light a candle unexpectedly; by which it is dazzled, and cannot find the way back to its retreat. It is a very voracious little animal, and will eat bread, flour, and meat; but it is particularly fond of sugar. They never drink, but keep for months together at the back of the chimney, where they could possibly have had no moisture, The warmth of their situation only serves to increase their mirth and loquacity. Except in the very coldest weather, they never cease their chirruping, but continue that little piercing note, which is as pleasing to some as it is disagreeable to others. The great Scaliger was particularly delighted with the chirruping of crickets, and kept several of them for his amusement, inclosed in a box, which he placed in a warm situation. Others on the contrary think there is something ominous and melancholy in the sound, and use every endeavour to banish this insect from their houses. Ledelius tells us of a woman who was very much incommoded by crickets, and tried, but in vain, every method of banishing them from her house. She at last accidentally succeeded; for having one day invited several guests to her house, where there was a wedding, in order to increase the festivity of the entertainment, she procured drums and trumpets to entertain them. The noise of those was so much greater than what the little animals were used to, that they instantly forsook their situation, and were never heard in that mansion more.

But of all the cricket kind, that which is called the *Mole Cricket* is the most extraordinary. This animal is the largest of all the insects with which we are acquainted in this country, being two inches and a half in length, and three quarters of an inch in breadth. The colour is of a dusky brown; and at the extremity of the tail there are two hairy excrescences resembling in some sense the tail of a mouse. The body consists of eight scaly joints or separate folds, is brown on the upper part, and more deeply tinged below. The wings are long, narrow, and terminate in a sharp point, each having a blackish line running down it: however, when they are extended, they appear to be much broader than could at first sight be supposed. The shield of the breast is of a firm texture, of a blackish colour and hairy. The fore-feet, which are this animal's principal instruments of burrowing into the earth, are strong, webbed, and hairy; it generally, however, runs backward; but it is commonly under ground, where it burrows even faster than a mole. It is thought also to be amphibious; and capable of living under water, as well as under ground

Of all insects this is the most detested by gardeners, as it chiefly resides in that ground which lies light, and where it finds sufficient plenty under the surface. Thus, in a single night's time, it will run along a furrow which has been newly sown, and rob it of all its contents. Its legs are formed in such a manner that it can penetrate the earth in every direction; before, behind, and above it. At night it ventures from its underground habitation, and, like the cricket, has its chirping call. When the female is fecundated, she makes a cell of clammy earth, the inside of which is large enough to hold two hazle nuts; and in this she lays her eggs.—The whole nest is about the size of a common hen's egg, closed up on every side, and well defended from the smallest breath of air. The eggs generally amount to the number of a hundred and fifty, being white, and of the size of a caraway comfit. They are thus carefully covered, as well to defend them from the injuries of the weather, as from the attacks of the black-beetle; that being itself an underground inhabitant, would but for this precaution, devour and destroy them. To prevent this, the female mole-cricket is often posted as a centinel near the nest, and when the black invader plunges in to seize its prey, the guardian insect seizes him behind, and instantly bites him in two.

Nothing can exceed the care and assiduity which these animals exhibit in the preservation of their young. Wherever the nest is placed, there seems to be a fortification, avenues, and entrenchments, drawn round it: there are numberless winding-ways that lead to it, and a ditch drawn about it, which few of its insect enemies are able to pass. But their care is not confined to this only; for at the approach of winter they carry their nest entirely away, and sink it deeper in the ground, so that the frost can have no influence in retarding the young brood from coming to maturity. As the weather grows milder, they raise their magazine in proportion; till, at last, they bring it as near the surface as they can, to receive the genial influence of the sun, without wholly exposing it to view; yet should the frost unexpectedly return, they sink it again as before.

CHAPTER V.

OF THE EARWIG, THE FROTH INSECT, AND OTHERS BELONGING TO THE SECOND ORDER OF INSECTS.

WE should still keep in memory that all insects of the second order, though not produced quite perfect from the egg, yet want very little of their perfection, and require but a very small change to arrive at that state which fits them for flight and generation. The natural functions in these are never suspended: from the instant they leave the egg, they continue to eat, to move, to leap, and pursue their prey: a slight change ensues: a skin that encloses a part of their body and limbs, bursts behind, like a woman's stays, and gives freedom to a set of wings, with which the animal expatiates, and flies in pursuit of its mate.

Of all this class of insects the earwig undergoes the smallest change. This animal is so common, that it scarce needs a description: its swiftness in the reptile state is not less remarkable than its indefatigable velocity when upon the wing. That it must be very prolific, appears from its numbers, and that it is very harmless, every one's experience can readily testify. It is provided with six feet, and two feelers; the tail is forked; and with this it often attempts to defend itself against every assailant. But its attempts are only the threats of impotence; they draw down the resentment of powerful animals, but no way serve to defend it. The deformity of its figure, and its slender make, have also subjected it to an imputation, which, though entirely founded in prejudice, has more than once procured its destruction. It is supposed, as the name imports, that it often enters into the ears of people sleeping; thus causing madness, from the intolerable pain, and soon after death itself. Indeed, the French name, which signifies the Ear-piercer, urges the calumny against this harmless insect in very plain terms: yet nothing can be more unjus : the ear is already filled with a substance which prevents any insect from entering; and besides, it is well lined and defended with membranes, which would keep out any little animal, even though the ear-wax were away. These reproaches, therefore, are entirely groundless: but it were well if the accusation which gardeners bring against the ear-wig were as slightly founded. There is nothing more certain than that it lives among flowers, and destroys them. When fruit also has been wounded by flies, the earwig generally comes in for a second feast, and sucks those juices which they first began to broach. Still, however, this insect is not so noxious as it would seem; and seldom is found but where the mischief has been originally begun by others. Like all of this class, the earwig is hatched from an egg. As there are various kinds of this animal, so they choose different places to breed in: in general, however, they lay their eggs under the bark of plants, or in the clefts of trees, when beginning to decay. They proceed from the egg in that reptile state in which they are most commonly seen; and, as they grow larger, the wings bound under the skin begin to bourgeon. It is amazing how very little room four large wings take up before they are protruded; for no person could ever conceive such an expansion of natural drapery could be rolled up in so small a pacquet. The sheath in which they are enveloped, folds and covers them so neatly that the animal seems quite destitute of wings*; and even when they are burst from their confinement, the animal, by the power of the muscles and joints which it has in the middle of its wings, can closely fold them into a very narrow compass. When the earwig has become a winged insect, it flies in pursuit of the female, ceasing to feed and is wholly employed in the business of propagation. It lives in its winged state but a few days; and having taken care for the continuance of posterity, dries up, and dies to all appearance consumptive.

To this order of insects we may also refer the Cuckow Spit, or Froth Worm, that is often found hid in that frothy matter which we find on the surface of plants. It has an oblong, obtuse body; and a large head, with small eyes. The external wings, for it has four, are of a dusky brown marked with two white spots: the head is black. The spume on which it is found wallowing, is all of its own formation, and very much resembles frothy spittle. It proceeds from the vent of the animal, and other parts of the body; and if it be wiped away, a new quantity will be quickly seen ejected from the little animal's body Within this spume it is seen in time to acquire four tubercles on its back, wherein the wings are enclosed; these bursting, from a reptile it becomes a winged animal; and thus rendered perfect, it flies to meet its mate, and propagate its kind.

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* Swammerdam, p 144.

The Water Tipula also belongs to this class. It has an oblong slender body, with four feet fixed upon the breast, and four feelers near the mouth. It has four weak wings, which do not at all seem proper for flying, but leaping only. But what this insect chiefly demands our attention for is, the wonderful lightness wherewith it runs on the surface of the water, so as scarce to put it in motion. It is sometimes seen in rivers, and on their banks, especially under shady trees; and generally in swarms of several together.

The common Water-Fly also breeds in the same manner with those above-mentioned. This animal is by some called Notonecta, because it does not swim, in the usual manner, upon its belly, but on its back: nor can we help admiring that fitness in this insect for its situation, as it feeds on the under-side of plants which grow on the surface of the water; and therefore it is thus formed with its mouth upwards, to take its food with greater convenience and ease.

We may also add the Water-Scorpion, which is a large insect, being near an inch in length, and about half on inch in breadth. Its body is nearly oval, but very flat and thin; and its tail long and pointed. The head is small; and the feelers appear like legs, resembling the claws of a scorpion, but without sharp points. This insect is generally found in ponds; and is, of all others, the most tyrannical and rapacious. It destroys, like a wolf among sheep, twenty times as many as its hunger requires One of these when put into a basin of water, in which were thirty or forty worms of the libellula kind, each as large as itself, destroyed them all in a few minutes; getting on their backs, and piercing with its trunk through their body. These animals, however, though so formidable to others, are nevertheless themselves greatly over-run with a little kind of louse, about the size of a nit, which very probably repays the injury which the water-scorpion inflicts upon others.

The water-scorpions live in the water by day; out of which they rise in the dusk of the evening into the air, and so flying from place to place, often betake themselves, in quest of food, to other waters. The insect, before its wings are grown, remains in the place where it was produced; but when come to its state of perfection, sallies forth in search of a companion of the other sex, in order to continue its noxious posterity.

CHAPTER VI.

OF THE EPHEMERA.

The last insect we shall add to the second order, is the Ephemera, which though not strictly belonging to it, seems more properly referred to this rank than any other. Indeed, we must not attend to the rigour of method, in a history where Nature seems to delight to sport in variety.

That there should be a tribe of flies, whose duration extends but to a day, seems at first surprising; but the wonder will increase when we are told, that some of this kind seem to be born to die in the space of a single hour. The reptile, however, from which they are bred, is by no means so short lived; but is sometimes seen to live two years and many times three years together.

All ephemeras, of which there are various kinds, are produced from the egg, in the form of worms; from whence they change into a more perfect form; namely, that of aurelias, which is a kind of middle state between a worm and a fly: and from thence they take their last mutation, which is into a beautiful fly, of longer or shorter duration, according to its kind.

The ephemera, in its fly state, is a very beautiful winged insect, and has a strong similitude to the butterfly, both from its shape and its wings. It is about the size of a middling butterfly; but its wings differ in not being covered with the painted dust with which those of butterflies are adorned, and rendered opake, for they are very transparent and very thin. These insects have four wings, the uppermost of which are much the largest. when the insect is at rest, it generally lays its wings one over the other, on the back. The body is long, being formed of six rings, that are larger at the origin than near the extremity; and from this a tail proceeds, that is taller than all the rest of the fly, and consists sometimes of three threads of an equal length, or sometimes of two long and one short. To acquire this beautiful form, the insect has been obliged to undergo several transmutations; but its glory is short lived, for the hour of its perfection is the hour of its death; and it seems scarcely introduced to pleasure, when it is obliged to part with life.

The reptile that is to become a fly, and that is granted so long a term, when compared to its latter duration, is an inhabitant of the water, and bears a very strong resemblance to fishes, in many particulars; having gills by which it breathes at the bottom, and also the tapering form of aquatic animals. These insects have six scaly legs fixed on their corselet. Their head is triangular; the eyes are placed forward, and may be distinguished by their largeness and colour. The mouth is furnished with teeth; and the body consists of six rings; that next the corselet being largest, but growing less and less to the end: the last ring is the shortest, from which the three threads proceed, which are as long as the whole body. Thus we see that the reptile bears a very strong resemblance to the fly; and only requires wings, to be very near its perfection.

As there are several kinds of this animal, their aurelias are consequently of different colours, some yellow, some brown, and some cream-coloured. Some of these also bore themselves cells at the bottom of the water, from which they never stir out, but feed upon the mud composing the walls of their habitation, in contented captivity; others, on the contrary, range about, go from the bottom to the surface, swim between two waters, quit that element entirely to feed upon plants by the river side, and then return to their favourite element for safety and protection.

The reptile, however, though it lives two or three years, offers but little, in its long duration, to excite curiosity: it is hid at the bottom of the water, and feeds almost wholly within its narrow habitation. The most striking facts command our attention during the short interval of its fly state, into which it crowds the most various transactions of its little life. 't then may be said to be in a hurry to live, as it has but so small a time to exist. The peculiar sign whereby to know that these reptiles will change into flies in a short time, consists in a protuberance of the wings on the back.—About that time the smooth and depressed form of the upper part of the body is changed into a more swollen and rounder shape; so that the wings are in some degree visible through the external sheath that covers them. As they are not natives of England, he who would see them in their greatest abundance, must walk, about sun-set, along the banks of the Rhine, or the Seine, near Paris; where, for about three days in the midst of summer, he will be astonished at their numbers and assiduity. The thickest descent of the flakes of snow in winter seem not to equal their number; the whole air seems alive with the new born race; and the earth itself is all over covered with their remains. The aurelias, or reptile insects, that are as yet beneath the surface of the water, wait only for the approach of evening to begin their transformation. The most industrious shake off their old garments about eight o'clock; and those who are the most tardy, are transformed before nine.

We have already seen that the operation of change in other insects is laborious and painful; but with these nothing seems shorter, or performed with greater ease. The aurelias are scarce lifted above the surface of the water, than their old sheathing skin bursts; and through the cavity which is thus formed, a fly issues, whose wings, at the same instant, are unfolded, and at the same time lift it into the air. Millions and millions of aurelias, rise in this manner to the surface; and at once become flies, and fill every quarter with their flutterings. But all these sports are shortly to have an end; for as the little strangers live but an hour or two, the whole swarm soon falls to the ground, and covers the earth, like a deep snow, for several hundred yards, on every side of the river. Their numbers are then incredible, and every object they touch becomes fatal to them, for they instantly die, if they hit even against each other.

At this time the males and females are very differently employed. The males, quite inactive and apparently without desires, seem only born to die: no way like the males of other insects; they neither follow the opposite sex, nor bear any enmity to each other: after fluttering for an hour or two, they drop upon land, without seeming to receive wings for scarce any other purpose but to satisfy an idle curiosity. It is otherwise with the females; they are scarce risen from the surface of the water, and have dried their wings, but they hasten to drop their eggs back again. If they happen also to flutter upon land, they deposit their burden in the place where they drop. But then it may be demanded, where, and in what manner, are these eggs fecundated, as no copulation whatever appears between the sexes, in their transitory visits in air? Swammerdam is of opinion that they are impregnated in the manner of fish-spawn, by the male, after being ejected by the female; but, beside that, this doctrine is exploded even from the history of fishes, it is certain that the males have not time for this operation, as the eggs drop to the bottom the instant they are laid on the water. Reaumur is of opinion that they copulate; but that the act bears a proportion in shortness to the small duration of their lives; and consequently, must be so soon performed, as to be scarcely visible. This, however, is at best forcing a theory; and it is probable, that as there are many insects known to breed without any impregnation from the male, as we have already seen in muscles and oysters, and shall hereafter see in the gnat, and a species of the beetle, so the ephemera may be of this number. Be this as it may, the females are in such haste to deposit their eggs, that multitudes of them fall to the ground; but the greatest part are laid in the water. As they flutter upon the surface, two clusters are seen issuing from the extremity of their bodies, each containing about three hundred and fifty eggs, which make seven hundred in all. Thus, of all insects, this appears to be the most prolific; and it would seem that there was a necessity for such a supply, as, in its reptile state, it is the favourite food of every kind of fresh water fish. It is in vain that these little animals form galleries at the bottom of the river, from whence they seldom remove; many kinds of fish break in upon their retreats, and thin their numbers. For this reason fishermen are careful to provide themselves with these insects, as the most grateful bait; and thus turn the fish's rapacity to its own destruction.

But though the usual date of those flies is two or three hours at farthest, there are some kinds that live several days; and one kind in particular, after quitting the water has another case or skin to get rid of. These are often seen in the fields and woods, distant from the water; but they are more frequently found in its vicinity. They are often found sticking upon walls and trees; and frequently with the head downwards, without changing place, or having any sensible motion. They are then waiting for the moment when they shall be divested of their last incommodious garment, which sometimes does not happen for two or three days together.

BOOK III.

OF INSECTS OF THE THIRD ORDER.

CHAPTER I.

OF THE CATERPILLARS IN GENERAL.

IF we take a cursory view of insects in general, caterpillars alone, and the butterflies and moths they give birth to, will make a third part of the number. Wherever we move, wherever we turn, these insects, in one shape or another, present themselves to our view. Some, in every state offer the most entertaining spectacle; others are beautiful only in their winged form. Many persons, of which number I am one, have an invincible aversion to caterpillars and worms of every species: there is something disagreeable in their slow, crawling motion, for which the variety of their colouring can never compensate. But others feel no repugnance at observing, and even handling them with the most attentive application.

There is nothing in the butterfly state so beautiful or splendid as these insects. They serve, not less than the birds themselves, to banish solitude from our walks, and to fill up our idle intervals with the most pleasing speculations. The butterfly makes one of the principal ornaments of oriental poetry; but in those countries, the insect is larger and more beautiful than with us.

The beauties of the fly may, therefore, very well excite our curiosity to examine the reptile. But we are still more strongly attached to this tribe from the usefulness of one of the number. The silk-worm is, perhaps, the most serviceable of all other animals; since from its labours, and the manufacture attending it, near a third part of the world are clothed, adorned, and supported.

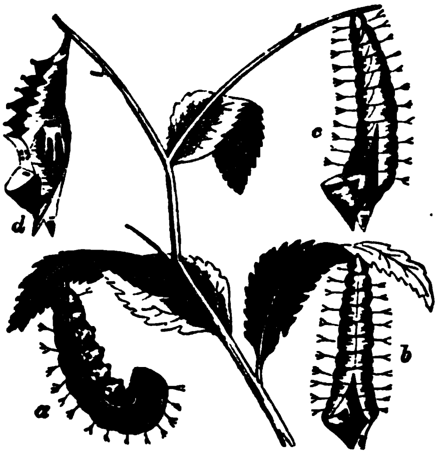
Caterpillars may be easily distinguished from worms or maggots, by the number of their feet; and by their producing butterflies or moths. When the sun calls up vegetation, and vivifies the various eggs of insects, the caterpillars are the first that are seen upon almost every vegetable and tree, eating its leaves and preparing for a state of greater perfection.—They have feet both before and behind; which not only enable them to move forward by a sort of steps made by their fore and hinder parts, but also to climb up vegetables, and to stretch themselves out from the boughs and stalks to reach their food at a distance. All of this class have from eight feet, at the least, to sixteen; and this may serve to distinguish them from the worm tribe, that never have so many. The animal into which they are converted is always a butterfly or a moth; and these are always distinguished from other flies, by having their wings covered over with a painted dust, which gives them such various beauty. The wings of flies are transparent, as we see in the common flesh-fly; while those of beetles are hard, like horn: from such the wings of a butterfly may be easily distinguished; and words would obscure their differences.

From hence it appears that caterpillars, whether in the reptile state, or advanced to their last state of perfection into butterflies, may easily be distinguished from all other insects; being animals peculiarly formed, and also of a peculiar nature. The transmutations they undergo, are also more numerous than those of any insect hitherto mentioned; and, in consequence, they have been placed in the third order of changes by Swammerdam, who has thrown such lights upon this part of natural history. In the second order of changes, mentioned before, we saw the grasshopper and the earwig, when excluded from the egg, assume a form very like that which they were after to preserve; and seemed arrived at a state of perfection, in all respects, except in not having wings; which did not bud forth until they were come to maturity. But the insects of this third order, that we are now about to describe, go through a much greater variety of transformations; for when they are excluded from the egg, they assume the form of a small caterpillar, which feeds and grows larger every day, often changing its skin, but still preserving its form. When the animal has come to a certain magnitude in this state, it discontinues eating, makes itself a covering or husk, in which it remains wrapped up, seemingly without life or motion; and after having for some time continued in this state, it once more bursts its confinement, and comes forth a butterfly. Thus we see this animal put on no less than three different appearances, from the time it is first excluded from the egg. It appears a crawling caterpillar; then an insensible aurelia, as it is called, without life or motion; and lastly, a beautiful butterfly, variously painted, according to its different kind. Having thus distinguished this class of insects from all others, we will first survey their history in general; and then enter particularly into the manners and nature of a few of them, which most deserve our curiosity and attention.

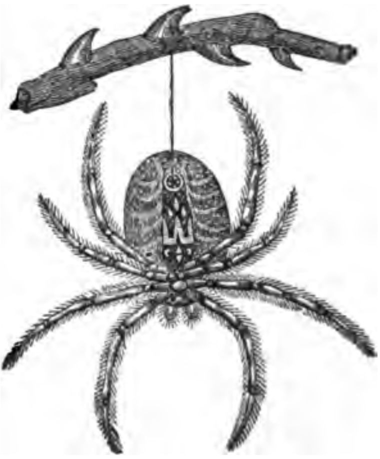
CHAPTER II.

OF THE TRANSFORMATION OF THE CATERPILLAR INTO ITS CORRESPONDING BUTTERFLY OR MOTH.

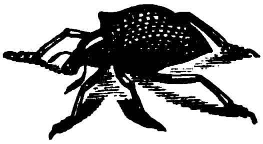
WHEN winter has disrobed the trees of their leaves, Nature then seems to have lost her insects. There are thousands of different kinds, with and without wings, which, though swarming at other seasons, then entirely disappear. Our fields are re-peopled, when the leaves begin to bud, by the genial influence of spring; and caterpillars of various sorts are seen feeding upon the promise of the year, even before the leaves are completely unfolded. Those caterpillars, which we then see, may serve



Chrysalides, p. 150.



Spider, p. 110.



Diamond Beetle, p. 157

Chrysalis of Moscheto.

To face p. 154, vol. iv.

to give us a view of the general means which Nature employs to preserve such a number of insects, during that season, when they can no longer find subsistence. It is known, by united experience, that all these animals are hatched from the eggs of butterflies; and those who observe them more closely, will find the fly very careful in depositing its eggs in those places where they are likely to be hatched with the greatest safety and success. During winter, therefore, the greatest number of caterpillars are in an egg state; and in this lifeless situation, brave all the rigours and the humidity of the climate; and though often exposed to all its changes, still preserve the latent principles of life, which is more fully exerted at the approach of spring. That same power that pushes forth the budding leaf, and the opening flower, impels the insect into animation; and Nature at once seems to furnish the guest and the banquet. When the insect has found force to break its shell, it always finds its favourite aliment provided in abundance before it.

But all caterpillars are not sent off from the egg in the beginning of spring; for many of them have subsisted during the winter in their aurelia state; in which, as we have briefly observed above, the animal is seemingly deprived of life and motion. In this state of insensibility, many of these insects continue during the rigours of winter; some inclosed in a kind of shell, which they have spun for themselves at the end of autumn; some concealed under the bark of trees; others in the chinks of old walls; and many buried under ground. From all these, a variety of butterflies are seen to issue in the beginning of spring; and adorn the earliest part of the year with their painted flutterings.

Some caterpillars do not make any change whatsoever at the approach of winter; but continue to live in their reptile state through all the severity of the season. These choose themselves some retreat, where they may remain undisturbed for months together; and there they continue motionless, and as insensible as if they were actually dead. Their constitution is such, that food at that time, would be useless; and the cold prevents their making those dissipations which require restoration. In general, caterpillars of this kind are found in great numbers together, inclosed in one common web, that covers them all, and serves to protect them from the injuries of the air.

Lastly, there are some of the caterpillar kind, whose butterflies live all the winter; and who, having fluttered about for some part of the latter end of autumn, seek for some retreat during the winter, in order to answer the ends of propagation, at the approach of spring. These are often found lifeless and motionless in the hollows of trees, or the clefts of timber; but, by being approached to the fire, they recover life and activity, and seem to anticipate the desires of spring.

In genera., however, whether the animal has subsisted in an egg state, during the winter; or whether as a butterfly, bred from an aurelia, in the beginning of spring; or a butterfly that has subsisted during the winter, and lays eggs as soon as the leaves of plants are shot forward, the whole swarm of caterpillars are in motion to share the banquet that Nature has provided. There is scarce a plant that has not its own peculiar insects, and some are known to support several of different kinds. Of these, many are hatched from tne egg, at the foot of the tree, and climb up to its leaves for subsistence; the eggs of others, have been glued by the parent butterfly to the leaves; and they are no sooner excluded from the shell, but they find themselves in the midst of plenty.

When the caterpillar first bursts from the egg, it is small and feeble its appetites are in proportion to its size, and it seems to make no great consumption; but as it increases in magnitude, it improves in its appetites; so that, in its adult caterpillar state, it is the most ravenous of all animals whatsoever. A single caterpillar will eat double its own weight of leaves in a day, and yet seems no way disordered by the meal. What would mankind do if their oxen or their horses were so voracious?

These voracious habits, with its slow crawling motion, but still more a stinging like that of nettles, which follows upon handling the greatest number of them, make these insects not the most agreeable objects of human curiosity. However, there are many philosophers who have spent years in their contemplation; and who have not only attended to their habits and labours, but minutely examined their structure and internal conformation.

The body of the caterpillar, when anatomically considered, is found composed of rings, whose circumference is pretty near circular or oval. They are generally twelve in number, and are all membranaceous; by which caterpillars may be distinguished from many other insects, tha nearly resemble them in form. The head of the caterpillar is connected to the first ring by the neck; that is generally so short and contracted, that it is scarce visible. All the covering of the head in caterpillars seems to consist of a shell; and they have neither upper nor under jaw, for they are both placed rather vertically, and each jaw armed with a large thick tooth, which is singly equal to numbers. With these the animals devour their food in such amazing quantities; and with these, some of the kind defend themselves against their enemies. Though the mouth be kept shut, the teeth are always uncovered; and while the insect is in health, they are seldom without employment. Whatever the caterpillar devours, these teeth serve to chop it into small pieces, and render the parts of the leaf fit for swallowing. Many kinds, while they are yet young, eat only the succulent part of the leaf, and leave all the fibres untouched; others, however, attack the whole leaf, and eat it clean away. One may be amused for a little time; in observing the avidity with which they are seen to feed; some are seen eating the whole day; others have their hours of repast; some choose the night, and others the day. When the caterpillar attacks a leaf, it places its body in such a manner that the edge of the leaf shall fall between its feet, which keeps it steady while the teeth are employed in cutting it: these fall upon the leaf, somewhat in the manner of a pair of gardener's shears; and every morsel is swallowed as soon as cut. Some caterpillars feed upon leaves so very narrow, that they are not broader than their mouths; in this case the animal is seen to devour it from the point, as we would eat a radish.

As there are various kinds of caterpillars, the number of their feet are various; some having eight, and some sixteen. Of these feet the six foremost are covered with a sort of shining gristle; and are therefore called the shelly legs. The hindmost feet, whatever be their number, are soft and flexible, and are called membranaceous. Caterpillars also, with regard to their external figure, are either smooth or hairy. The skin of the first kind is soft to the touch, or hard like shagreen; the skin of the latter is hairy and, as it were, thorny; and generally, if handled, stings like nettles. Some of them even cause this stinging pain, if but approached too nearly.

Caterpillars, in general, have six small black spots placed on the circumference of the fore ring, and a little to the side of the head. Three of these are larger than the rest, and are convex and transparent; these Reaumur takes to be the eyes of the caterpillar; however, most of these reptiles have very little occasion for sight, and seem only to be directed by their feeling.

But the parts of the caterpillar's body which most justly demand our attention, are the stigmata, as they are called; or those holes on the sides of its body; through which the animal is supposed to breathe. All along this insect's body, on each side, these holes are easily discoverable. They are eighteen in number, nine on a side, rather nearer the belly than the back; a hole for every ring, of which the animal's body is composed, except the second, the third, and the last. These oval openings may be considered as so many mouths, through which the insect breathes; but with this difference, that as we have but one pair of lungs, the caterpillar has no less than eighteen. It requires no great anatomical dexterity to discover these lungs in the larger kind of caterpillars: they appear at first view, to be hollow cartilaginous tubes, and of the colour of mother-of-pearl. These tubes are often seen to unite with each other; some are perceived to open into the intestines; and some go to different parts of the surface of the body. That these vessels serve to convey the air, appears evidently, from the famous experiments of Malpighi; who by stopping up the mouths of the stigmata with oil, quickly suffocated the animal, which was seen to die convulsed the instant after. In order to ascertain his theory, he rubbed oil upon other parts of the insect's body, leaving the stigmata free; and this seemed to have no effect upon the animal's health, but it continued to move and eat as usual: he rubbed oil on the stigmata on one side, and the animal underwent a partial convulson, but recovered soon after. However, it ought to be observed, that air is not so necessary to these as to the nobler ranks of animals, since caterpillars will live in an exhausted receiver for several days together; and though they seem dead at the bottom, yet when taken out, they recover, and resume their former vivacity.

If the caterpillar be cut open longitudinally along the back, its intestines will be perceived running directly in a straight line from the mouth to the anus. They resemble a number of small bags opening into each other; and strengthened on both sides by a fleshy cord, by which they are united. These insects are, upon many occasions, seen to cast forth an internal coat of their intestines with their food, in the changes which they so frequently undergo. But the intestines take up but a small part of the animal's body, if compared to the fatty substance in which they are involved. This substance changes colour when the insect's metamorphosis begins to approach; and from white it is usually seen to become yellow If to these parts, we add the caterpillar's implements for spinning, (for all caterpillars spin at one time or another) we shall have a rude sketch of this animal'sconformation; however, we shall reserve the description of those parts, till we come to the history of the silk-worm, where the manner in which these insects spin their webs, will most properly find place.

The life of a caterpillar seems one continued succession of changes and it is seen to throw off one skin only to assume another; which also is divested in its turn: and thus for eight or ten times successively. We must not, however, confound this changing of the skin with the great metamorphosis which it is afterwards to undergo. The throwing off one skin, and assuming another, seems, in comparison, but a slight operation among these animals: this is but the work of a day; the other is the great adventure of their lives. Indeed, this faculty of changing the skin, is not peculiar to caterpillars only, but is common to all the insect kind; and even to some animals that claim a higher rank in Nature. We have already seen the lobster and the crab outgrowing their first shells, and then bursting from their confinement, in order to assume a covering more roomy and convenient. It is probable that the louse, the flea, and the spider, change their covering from the same necessity; and growing too large for the crust in which they have been for some time enclosed, burst it for another. This period is probably that of their growth; for as soon as their new skin is hardened round them, the animal's growth is necessarily circumscribed, while it remains within it. With respect to caterpillars, many of them change their skins five or six times in a season; and this covering, when cast off, often seems so complete, that many might mistake the empty skin for the real insect. Among the hairy caterpillars, for instance, the cast skin is covered with hair; the feet, as well gristly as membraneous, remain fixed to it; even the parts which nothing but a microscope can discover, are visible in it; in short, all the parts of the head; not only the skull but the teeth.

In proportion as the time approaches in which the caterpillar is to cast its old skin, its colours become more feeble, the skin seems to wither and grow dry, and in some measure resembles a leaf, when it is no longer supplied with moisture from the stock. At that time the insect begins to find itself under the necessity of changing; and it is not effected without violent labour, and perhaps pain. A day or two before the critical hour approaches, the insect ceases to eat, loses its usual activity, and seems to rest immoveable. It seeks some place to remain in security; and no longer timorous, seems regardless even of the touch. It is now and then seen to bend itself and elevate its back; again it stretches to its utmost extent: it sometimes lifts up its head, and then lets it fall again; it sometimes waves it three or four times from side to side, and then remains in quiet. At length, some of the rings of its body, particularly the first and second are seen to swell considerably, the old skin distends and bursts till, by repeated swellings and contractions in every ring the animal disengages itself, and creeps from its inconvenient covering.

How laborious soever this operation may be, it is performed in the space of a minute; and the animal, having thrown off its old skin, seems to enjoy new vigour, as well as acquired colouring and beauty. Sometimes it happens that it takes a new appearance and colours very different from the old. Those that are hairy, still preserve their covering; although their ancient skin seems not to have lost a single hair: every hair appears to have been drawn like a sword from the scabbard. However, the fact is, that a new crop of hair grows between the old skin and the new, and probably helps to throw off the external covering.

The caterpillar having in this manner continued for several days feeding, and at intervals casting its skin, begins at last to prepare for its change into an aurelia. It is most probable that, from the beginning, all the parts of the butterfly lay hid in this insect, in its reptile state; but it required time to bring them to perfection; and a large quantity of food, to enable the animal to undergo all the changes requisite for throwing off these skins, which seem to clog the butterfly form. However, when the caterpillar has fed sufficiently, and the parts of the future butterfly have formed themselves beneath its skin, it is then time for it to make its first, great, and principal change into an aurelia, or a chrysalis, as some have chosen to call it; during which, as was observed, it seems to remain for several days, or even months, without life or motion.

Preparatory to this important change, the caterpillar most usually quits the plant, or the tree on which it fed; or at least attaches itself to the stalk or the stem, more gladly than the leaves. It forsakes its food, and prepares, by fasting, to undergo its transmutation. In this period, all the food it has taken is thoroughly digested; and it often voids even the internal membrane which lined its intestines. Some of this tribe, at this period also, are seen entirely to change colour; and the vivacity of the tints, in all, seems faded. Those of them which are capable of spinning themselves a web, set about this operation; those which have already spun, await the change in the best manner they are able. The web or cone, with which some cover themselves, hides the aurelia contained within from the view; but in others where it is more transparent, the caterpillar, when it has done spinning, strikes into it the claws of the two feet under the tail, and afterwards forces in the tail itself, by contracting those claws, and violently striking the feet one against the other. If, however, they be taken from their web at this time, they appear in a state of great languor; and, incapable of walking, remain on that spot where they are placed. In this condition they remain one or two days preparing to change into an aurelia; somewhat in the manner they make preparations for changing the skin. They then appear with their bodies bent into a bow, which they now and then are seen to straighten: they make no use of their legs; but if they attempt to change place, do it by the contortions of their body. In proportion as their change into an aurelia approaches, their body becomes more and more bent; while their extensions and convulsive contractions become more frequent. The hinder end of the body is the part which the animal first disengages from its caterpillar skin; that part of the skin remains empty, while the body is drawn up contractedly towards the head. In the same manner they disengage themselves from the two succeeding rings; so that the animal is then lodged entirely in the fore part of its caterpillar covering: that half which is abandoned, remains placid and empty; while the fore-part, on the contrary, is swollen and distended. The animal, having thus quitted the hinder part of its skin, to drive itself up into the fore-part, still continues to heave and work as before; so that the skull is soon seen to burst into three pieces, and a longitudinal opening is made, in the three first rings of the body, through which the insect thrusts forth its naked body with strong efforts. Thus at last it entirely gets free from its caterpillar skin and for ever forsakes its most odious reptile form.

The caterpillar, thus stripped of its skin for the last time, is now become an aurelia; in which the parts of the future butterfly are all visible, but in so soft a state that the smallest touch can discompose them. The animal is now become helpless and motionless; but only waits for the assistance of the air to dry up the moisture on its surface, and supply with a crust capable of resisting external injuries. Immediately after being stripped of its caterpillar skin, it is of a green colour, especially in those parts which are distended by an extraordinary afflux of animal moisture; but in ten or twelve hours after being thus exposed, its parts harden, the air forms its external covering into a firm crust, and in about four and twenty hours, the aurelia may be handled without endangering the little animal that is thus left in so defenceless a situation. Such is the history of the little pod or cone that is found so common in every pathway, sticking to nettles, and sometimes shining like polished gold. From the beautiful and resplendent colour, with which it is thus sometimes adorned, some authors have called it a Chrysalis, implying a creature made of gold.

Such are the efforts by which these animals prepare for a state of perfection; but their care is still greater to provide themselves a secure retreat, during this season of their imbecility. It would seem like erecting themselves a monument, where they were to rest secure, until Nature had called them into a new and more improved existence. For this purpose, some spin themselves a cone or web, in which they lie secure till they have arrived at maturity: others, that cannot spin so copious a covering, suspend themselves by the tail, in some retreat where they are not likely to meet disturbances. Some mix sand with their gummy and moist webs, and thus make themselves a secure incrustation; while others, before their change, bury themselves in the ground, and thus avoid the numerous dangers that might attend them. One would imagine that they were conscious of the precise time of their continuance in their aurelia state, since their little sepulchres, with respect to the solidity of the building, are proportioned to such duration. Those that are to lie in that state of existence but a few days, make choice of some tender leaf, which they render still more pliant by diffusing a kind of glue upon it: the leaf thus gradually curls up, and withering as it enfolds, the insect wraps itself within, as in a mantle, till the genial warmth of the sun enables it to struggle for new life, and burst from its confinement. Others, whose time of transformation is also near at hand, fasten their tails to a tree, or to the first worm-hole they meet in a beam, and wait in that defenceless situation. Such caterpillars, on the other hand, as are seen to lie several months in their aurelia state, act with much greater circumspection. Most of them mix their web with sand, and thus make themselves a strong covering; others build in wood, which serves them in the nature of a coffin. Such as have made the leaves of willows their favourite food, break the tender twigs of them first into small pieces, then pound them as it were to powder; and, by means of their glutinous silk, make a kind of paste, in which they wrap themselves up. Many are the forms which these animals assume in this helpless state; and it often happens, that the most deformed butterflies issue from the most beautiful aurelias.

In general, however, the aurelia takes the rude outline of the parts of the animal which is contained within it; but as to the various colours of which it is seen to assume, they are rather the effect of accident; for the same species of insect does not at all times assume the same hue, when it becomes an aurelia. In some, the beautiful gold colour is at one time found; in others, it is wanting. This brilliant hue, which does not fall short of the best gilding, is formed in the same manner in which we see leather obtain a gold colour, though none of that metal ever enters into the tincture. It is only formed by a beautiful brown varnish, laid upon a white ground; and the white thus gleaming through the transparency of the brown, gives a charming golden yellow. These two colours are found, one over the other, in the aurelia of the little animal we are describing; and the whole appears gilded, without any real gilding.

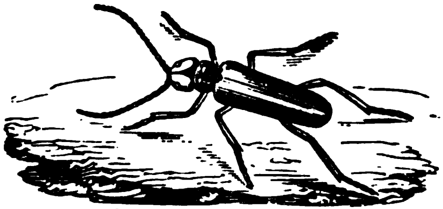
The aurelia thus formed, and left to time to expand into a butterfly, in some measure resembles an animal in an egg, that is to wait for external warmth to hatch it into life and vigour. As the quantity of moisture that is inclosed within the covering of the aurelia, continues to keep its body in the most tender state, so it is requisite that this humidity should be dried away, before the little butterfly can burst its prison. Many have been the experiments to prove that Nature may in this respect be assisted by art; and that the life of the insect may be retarded or quickened, without doing it the smallest injury. For this purpose, it is only requisite to continue the insect in its aurelia state, by preventing the evaporation of its humidity; which will consequently add some days, nay weeks, to its life: on the other hand by evaporating its moisture, in a warm situation, the animal assumes its winged state before the usual time, and goes through the offices assigned its existence. To prove this, Mr. Reaumur enclosed the aurelia in a glass tube: and found the evaporated water, which exhaled from the body of the insect, collected in drops at the bottom of the tube: he covered the aurelia with varnish; and this making the evaporation more difficult and slow, the butterfly was two months longer than its natural term, in coming out of its case; he found, on the other hand, that by laying the animal in a warm room, he hastened the disclosure of the butterfly; and by keeping it in an ice-house in the same manner he delayed it. Warmth acted, in this case, in a double capacity; invigorating the animal, and evaporating the moisture.

The aurelia, though it bears a different external appearance nevertheless contains within it all the parts of the butterfly in perfect formation; and lying each in a very orderly manner, though in the smallest compass. These, however, are so fast and tender, that is impossible to visit without discomposing them. When, either by warmth, or increasing vigour, the parts have acquired the necessary force and solidity, the butterfly then seeks to disembarrass itself of those bands which kept it so long in confinement. Some insects continue under the form of an aurelia not above ten days; some twenty; some several months; and even for a year together.

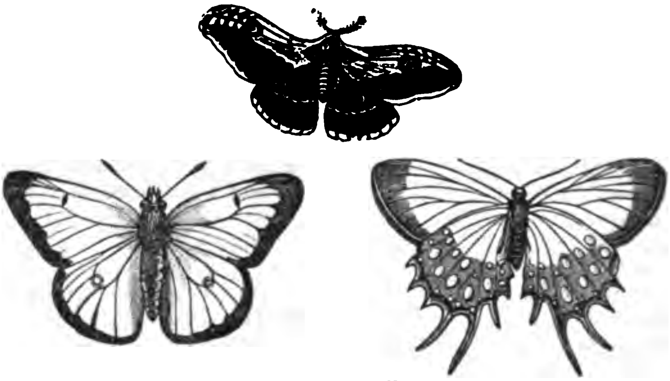
The butterfly, however, does not continue so long under the form of an aurelia, as one would be apt to imagine. In general, those caterpillars that provide themselves with cones, continue within them but a few days after the cone is completely finished. Some, however, remain buried in this artificial covering for eight or nine months, without taking the smallest sustenance during the whole time: and though in the caterpillar state no animals were so voracious, when thus transformed they appear a mira cle of abstinence. In all, sooner or later, the butterfly bursts from its prison; not only that natural prison which is formed by the skin of the aurelia, but also from that artificial one of silk, or any other substance in which it has inclosed itself.

The efforts which the butterfly makes to get free from its aurelia state, are by no means so violent as those which the insect had in changing from the caterpillar into the aurelia. The quantity of moisture surrounding the butterfly is by no means so great as that attending its former change; and the shell of the aurelia is so dry, that it may be cracked between the fingers.

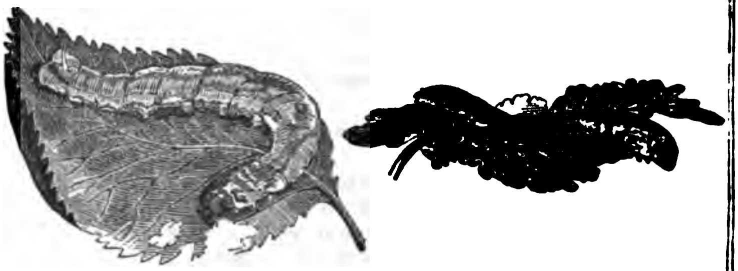
If the animal be shut up within a cone, the butterfly always gets rid of the natural internal skin of the aurelia, before it eats its way through the external covering which its own industry has formed round it. In order to observe the manner in which it thus gets rid of the aurelia covering, we must cut open the cone, and then we shall have an opportunity of discovering the insect's efforts to emancipate itself from its natural shell. When this operation begins, there seems to be a violent agitation in the humours contained within the little animal's body. Its fluid seems driven, by an hasty fermentation, through all the vessels; while it labours violently with its legs, and makes several other violent struggles to get free. As all these motions concur with the growth of the insect's wings and body, it is impossible that the brittle skin which covers it should longer resist: it at length gives way, by bursting into four distinct and regular pieces. The skin of the head and legs first separates; then the skin at the back flies open, and dividing into two regular portions, disengages the back and wings: then there likewise happens another rupture in that portion which covered the rings of the back of the aurelia. After this, the butterfly, as if fatigued with its struggles, remains very quiet for some time, with its wings pointed downwards, and its legs fixed in the skin which it had just thrown off. At first sight the animal, just set free, and permitted the future use of its wings, seems to want them entirely; they take up such little room, that one would wonder where they were hidden. But soon after, they expand so rapidly, that the eye can scarce attend their unfolding. From reaching scarce half the length of the body, they acquire in a most wonderful manner, their full extent and bigness, so as to be each five times larger then they were before. Nor is it the wings alone that are thus increased: all their spots and paintings, before so minute as to be scarce discernible, are proportionably extended; so that, what a few minutes before seemed only a number of confused, unmeaning points, now become distinct and most beautiful ornaments. Nor are the wings, when they are thus expanded, unfolded in the manner in which earwigs and grasshoppers display theirs, who unfurl them like a lady's fan: on the contrary, those of butterflies actually grow to their natural size in this very short space. The wing, at the instant it is freed from its late confinement, is considerably thicker than afterwards; so that it spreads in all its dimensions, growing thinner as it becomes broader. If one of the wings be plucked from the animal just set free, it may be spread by the fingers, and it will soon become as broad as the other, which has been left behind. As the wings extend themselves so suddenly, they have not yet had time to dry; and accordingly appear like pieces of wet paper, soft and full of wrinkles.—In about half an hour, they are perfectly dry, their wrinkles entirely dis



Blister Beetle, or Cantharides, p. 162.



Butterflies, p. 163.



Caterpillars, p. 167.

To face p. 163, vol. iv.

appear and the little animal assumes all its splendour. The transmutation being thus perfectly finished, the butterfly discharges three or four drops of a blood-coloured liquid, which are the last remains of its superfluous moisture.—Those aurelias which are enclosed within a cone, find their exit more difficult, as they have still another prison to break through: this, however, they perform in a short time; for the butterfly, freed from its aurelia skin, butts with its head violently against the walls of its artificial prison; and probably with its eyes, that are rough and like a file, it rubs the internal surface away; till it is at last seen bursting its way into open life; and, in less than a quarter of an hour, the animal acquires its full perfection.

Thus, to use the words of Swammerdam, we see a little insignficant creature distinguished, in its last birth, with qualifications and ornaments, which man, during his stay upon earth, can never even hope to acquire. The butterfly to enjoy life, needs no other food but the dews of Heaven, and the honeyed juices which are distilled from every flower. The pageantry of princes cannot equal the ornaments with which it is invested; nor the rich colouring that embellishes its wing. The skies are the butterfly's proper habitation, and the air its element; whilst man comes into the world naked and often roves about without habitation or shelter; exposed, on the one hand, to the heat of the sun; and, on the other, to the damps and exhalations of the earth; both alike enemies of his happiness and existence. A strong proof that, while this little animal is raised to its greatest height, we are as yet in this world, only candidates for perfection!

CHAPTER III

OF BUTTERFLIES AND MOTHS

IT has been already shown that all butterflies are bred from caterpillars; and we have exhibited the various circumstances of that surprising change. It has been remarked, that butterflies may be easily distinguised from flies of every other kind, by their wings; for, in others, they are either transparent, like gauze, as we see in the common flesh-fly; or they are hard and crusted as we see in the wings of the beetle. But in the butterfly, the wings are soft, opake, and painted over with a beautiful dust that comes off with handling.

The number of these beautiful animals is very great; and though Linnæus has reckoned up above seven hundred and sixty different kinds, the catalogue is still very incomplete. Every collector of butterflies can show undescribed species: and such as are fond of minute discovery, can here produce animals that have been examined only by himself. In general, however, those of the warm climates are larger and more beautiful than such as are bred at home; and we can easily admit the beauty of the butterfly, since we are thus freed from the damage of the caterpillar. It has been the amusement of some to collect these animals, from different parts of the world; or to breed them from caterpillars at home. These they arrange in systematic order, or dispose so as to make striking and agreeable pictures; and all must grant that this specious idleness is far preferable to that unhappy state which is produced by a total want of employment.

The wings of butterflies, as was observed, fully distinguish them from flies of every other kind. They are four in number; and although two of them be cut off, the animal can fly with the two others remaining. They are, in their own substance, transparent; but owe their opacity to the beautiful dust with which they are covered; and which has been likened by some naturalists to the feathers of birds; by others to the scales of fishes; as their imaginations were disposed to catch the resemblance. In fact, if we regard the wing of a butterfly with a good microscope, we shall perceive it studded over with a variety of little grains of different dimensions and forms, generally supported upon a footstalk, regularly laid upon the whole surface.—Nothing can exceed the beautiful and regular arrangement of these little substances; which thus serve to paint the butterfly's wings, like the tiles of a house. Those of one rank are a little covered by those that follow: they are of many figures; on one part of the wing may be seen a succession of oval studs; on another part, a cluster of studs, each in the form of a heart. in one place they resemble a hand open; and in another they are long or triangular; while all are interspersed with taller studs, that grow between the rest, like mushrooms upon a stalk. The wing itself is composed of several thick nerves, which render the construction very strong, though light; and though it be covered over with thousands of these scales or studs, yet its weight is very little increased by the number. The animal is with ease enabled to support itself a long while in air, although its flight be not very graceful. When it designs to fly to a considerable distance, it ascends and descends alternately; going sometimes to the right, sometimes to the left, without any apparent reason. Upon closer examination, however, it will be found that it flies thus irregularly in pursuit of its mate; and as dogs bait and quarter the ground in pursuit of their game, so these insects traverse the air in quest of their mates, whom they can discover at more than a mile's distance.

If we prosecute our description of the butterfly, the animal may be divided into three parts; the head, the corselet, and the body.

The body is the hinder part of the butterfly, and is composed of rings which are generally concealed under long hair, with which that part of the animal is clothed. The corselet is more solid than the rest of the body because the fore-wings and the legs are fixed therein. The legs are six in number, although four only are made use of by the animal; the two fore-legs being often so much concealed in the long hair of the body, that it is sometimes difficult to discover them. If we examine these parts internally, we shall find the same set of vessels in the butterfly that we observed in the caterpillar, but with this great difference, that as the blood or humours in the caterpillar circulated from the tail to the head, they are found in the butterfly to take a direct contrary course, and to circulate from the head to the tail; so that the caterpillar may be considered as the embryo animal, in which, as we have formerly seen, the circulation is carried on differently from what it is in animals when excluded.

But leaving the other parts of the butterfly, let us turn our attention particularly to the head. The eyes of butterflies have not all the same form; for in some they are large, in others small; in some, they are the larger portion of a sphere, in others they are but a small part of it, and just appearing from the head. In all of them, however, the outward coat has a lustre, in which may be discovered the various colours of the rainbow. When examined a little closely, it will be found to have the appearance of a multiplying-glass; having a great number of sides or facets, in the manner of a brilliant cut diamond. In this particular, the eye of the butterfly and of most other insects, entirely correspond; and Lewenhoek pretends, there are above six thousand facets on the cornea of a flea. These animals, therefore, see not only with great clearness but view every object multiplied in a surprising manner. Puget adapted the cornea of a flea in such a position, as to see objects through it by the means of a microscope; and nothing could exceed the strangeness of its representations. A soldier, who was seen through it, appeared like an army of pigmies; for while it multiplied, it also diminished the object; the arch of a bridge exhibited a spectacle more magnificent than human skill could perform; the flame of a candle seemed a beautiful illumination. It still, however, remains a doubt, whether the insect sees objects singly, as with one eye; or whether every facet is itself a complete eye, exhibiting its own object distinct from all the rest.

Butterflies, as well as most other flying insects, have two instruments, like horns, on their heads, which are commonly called feelers. They differ from the horns of greater animals, in being moveable at their base; and in having a great number of joints, by which means the insect is enabled to turn them in every direction. Those of butterflies are placed at the top of the head, pretty near the external edge of each eye. What the use of these instruments may be, which are thus formed with so much art, and by a *workman* who does nothing without reason, is as yet unknown to man. They may serve to guard the eye; they may be of use to clean it; or they may be the organ of some sense which we are ignorant of: but this is only explaining one difficulty by another. We are not so ignorant of the uses of the trunk, which few insects of the butterfly kind are without. This instrument is placed exactly between the eyes; and when the animal is not employed in seeking its nourishment, it is rolled up like a curl. A butterfly, when it is feeding, flies round some flower, and settles upon it. The trunk is then uncurled, and thrust out either wholly or in part; and it is employed in searching the flower to its very bottom, let it be ever so deep.

This search being repeated seven or eight times, the butterfly then passes to another; and continues to hover over those agreeable to its taste, like a bird over its prey. This trunk consists of two equal hollow tubes, nicely joined to each other, like the pipes of an organ.

Such is the figure and conformation of these beautiful insects that cheer our walks, and give us the earliest intimations of summer. But it is not by day alone that they are seen fluttering wantonly from flower to flower, as the greatest number of them fly by night, and expand the most beautiful colouring at those hours when there is no spectator. This tribe of insects has therefore been divided into Diurnal and Nocturnal Flies; or more properly speaking, into Butterflies and Moths: the one flying only by day, the other most usually on the wing in the night. They may be easily distinguished from each other by their horns or feelers; those of the butterfly being clubbed, or knobed at the end; those of the moth tapering finer and finer to a point. To express it technically—the feelers of butterflies are clavated; those of moths are filiform.

The butterflies, as well as the moths, employ the short life assigned them, in a variety of enjoyments. Their whole time is spent either in quest of food, which every flower offers; or in pursuit of the female, whose approach they can often perceive at two miles distance. Their sagacity in this particular is not less astonishing than true; but by what sense they are thus capable of distinguishing each other at such distances, is not easy to conceive. It cannot be by the sight, since such small objects as they are must be utterly imperceptible at half the distance at which they perceive each other: it can scarcely be by the sense of smelling, since the animal has no organs for that purpose Whatever be their powers of perception, certain it is, that the male, after having fluttered, as if carelessly about for some time, is seen to take wing, and go forward, sometimes for two miles together, in a direct line, to where the female is perched on a flower.

The general rule among insects is, that the female is larger than the male; and this obtains particularly in the tribe I am describing. The body of the male is smaller and slenderer; that of the female more thick and oval. Previous to the junction of these animals, they are seen sporting in the air, pursuing and flying from each other, and preparing, by a mock combat, for the more important business of their lives. If they be disturbed while united, the female flies off with the male on her back, who seems entirely passive upon the occasion.

But the females of many moths and butterflies seem to have assumed their airy form for no other reason but to fecundate their eggs and lay them. They are not seen fluttering about in quest of food or a mate; all that passes during their short lives, is a junction with the male of about half an hour; after which they deposit their eggs and die, without taking any nourishment or seeking any. It may be observed, however, that in all the females of this tribe, they are impregnated by the male by one aperture and lay their eggs by another.

The eggs of female butterflies are disposed in the body like a bed of chaplets; which, when excluded, are usually oval, and of a whitish colour, some, however, are quite round; and others flatted, like a turnip. The covering, or shell of the egg, though solid, is thin and transparent; and in proportion as the caterpillar grows within the egg, the colours change, and are distributed differently. The butterfly seems very well instructed by Nature in the choice of the plant, or the leaf, where it shall deposit its burthen. Each egg contains but one caterpillar; and it is requisite that this little animal, when excluded, should be near its peculiar provision. The butterfly, therefore, is careful to place her brood only upon those plants that afford good nourishment to its posterity. Though the little winged animal has been fed itself upon dew, or the honey of flowers, yet it makes choice for its young of a very different provision, and lays its eggs on the most unsavoury plants; the rag-weed, the cabbage, or the nettle. Thus every butterfly chooses not the plant most grateful to it in its winged state; but such as it has fed upon in its reptile form.

All the eggs of butterflies are attached to the leaves of the favourite plant, by a sort of size or glue; where they continue, unobserved, unless carefully sought after. The eggs are sometimes placed round the tender shoots of plants, in the form of bracelets, consisting of above two hundred in each, and generally surrounding the shoot, like a ring upon a finger. Some butterflies secure their eggs from the injuries of air, by covering them with hair, plucked from their own bodies, as birds sometimes are seen to make their nests; so that their eggs are thus kept warm, and also entirely concealed.

All the tribe of female moths lay their eggs a short time after they leave the aurelia; but there are many kinds that flutter about the whole summer, and do not think of laying, till the winter begins to warn them of their approaching end: some even continue the whole winter in the hollows of trees, and do not provide for posterity until the beginning of April, when they leave their retreats, deposit their eggs, and die. Their eggs soon begin to feel the genial influence of the season: the little animals burst from them in their caterpillar state, to become aurelias and butterflies in their turn: and thus to continue the round of Nature.

CHAPTER IV.

OF THE ENEMIES OF THE CATERPILLAR

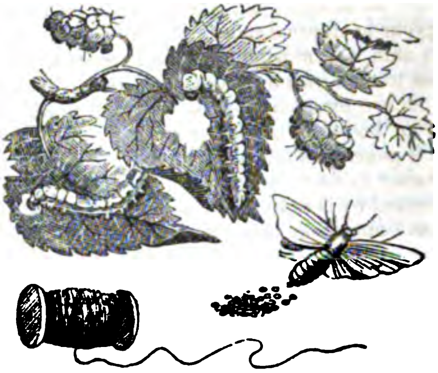
NATURE, though it has rendered some animals surprisingly fruitful, yet ever takes care to prevent their too great increase. One set of creatures is generally opposed to another: and those are chiefly the most prolific that are, from their imbecility, incapable of making any effectual defence. The caterpillar has, perhaps, of all other animals, the greatest number of enemies; and seems only to exist by its surprising fecundity. Some animals devour them by hundreds; others, more minute yet more dangerous, mangle them in various ways; so that, how great soever their numbers may be, their destroyers are in equal proportion. Indeed, if we consider the mischief these reptiles are capable of occasioning, and the various damages we sustain from their insatiable rapacity, it is happy for the other ranks of Nature, that there are thousands of fishes, birds, and even insects, that live chiefly upon caterpillars, and make them their most favourite repast.

When we describe the little birds that live in our gardens, and near our houses, as destructive neighbours, sufficient attention was not paid to the services which they are frequently found to render us. It has been proved, that a single sparrow and its mate, that have young ones, destroy above three thousand caterpillars in a week; not to mention several butterflies, in which numberless caterpillars are destroyed in embryo. It is in pursuit of these reptiles that we are favoured with the visits of many of our most beautiful songsters; that amuse us during their continuance, and leave us when the caterpillars disappear.

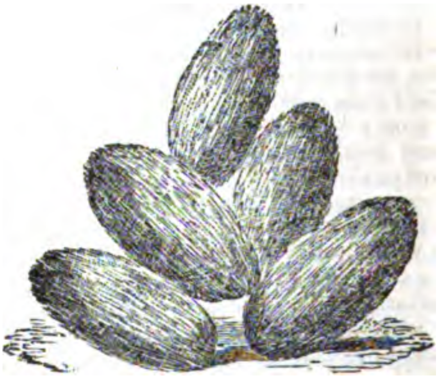
The maxim which has often been urged against man, that he, of all other animals, is the only creature that is an enemy to his own kind, and that the human species only are found to destroy each other, has been adopted by persons who never considered the history of insects. Some of the caterpillar kind in particular, that seem fitted only to live upon leaves and plants, will, however, eat each other; and the strongest will devour the weak, in preference to their vegetable food. That which lives upon the oak is found to seize any of its companions, which it conveniently can, by the first rings, and inflict a deadly wound: it then feasts in tranquillity on its prey, and leaves nothing of the animal but the husk.

But it is not from each other they have the most to fear, as in general they are inoffensive; and many of this tribe are found to live in a kind of society. Many kind of flies lay their eggs either upon, or within their bodies; and as these turn into worms, the caterpillar is seen to nourish a set of intestine enemies within its body, that must shortly be its destruction: Nature having taught flies, as well as all other animals, the surest methods of perpetuating their kind. "Towards the end of August," says Reaumur, "I perceived a little fly, of a beautiful gold colour, busily employed on the body of a large caterpillar, of that kind which feeds upon cabbage. I gently separated that part of the leaf on which these insects were placed from the rest of the plant, and placed it where I might observe them more at my ease. The fly, wholly taken up by the business in which it was employed, walked along the caterpillar's body, now and then remaining fixed to a particular spot. Upon this occasion I perceived it every now and then dart a sting, which it carried at the end of its tail, into the caterpillar's body, and then drew it out again, to repeat the same operation in another place. It was not difficult for me to conjecture the business which engaged this animal so earnestly; its whole aim was to deposit its eggs in the caterpillar's body; which was to serve as a proper retreat for bringing them to perfection. The reptile thus rudely treated, seemed to bear all very patiently, only moving a little when stung too deeply; which, however, the fly seemed entirely to disregard. I took particular care to feed this caterpillar; which seemed to me to continue as voracious and vigorous as any of the rest of this kind. In about ten or twelve days, it changed into an aurelia, which seemed gradually to decline, and died: upon examining its internal parts, the animal was entirely devoured by worms; which, however, did not come to perfection, as it is probable they had not enough to sustain them within."

What the French philosopher perceived upon this occasion, is every day to be seen in several of the larger kinds of caterpillars, whose bodies serve as a nest to various flies, that very carefully deposit their eggs within them. The large cabbage caterpillar is so subject to its injuries, that at certain seasons it is much easier to find them with than without them. The ichneumon fly, as it is called, particularly infests these reptiles, and prevents their fecundity. This fly is of all others, the most formidable to insects of various kinds. The spider, that destroys the ant, the moth, and the butterfly, yet often falls a prey to the ichneumon; who pursues the robber to his retreat, and, despising his nets, tears him in pieces, in the very labyrinth he has made. This insect, as redoubtable as the little quadruped that destroys the crocodile, has received the same name; and from its destruction of the caterpillar tribe, is probably more serviceable to mankind. This insect, I say, makes the body of the caterpillar the place for depositing its eggs; to the number of ten, fifteen, or twenty. As they are laid in those parts which are not mortal, the reptile still continues to live, and to feed, showing no signs of its being incommoded by its new guests. The caterpillar changes its skin; and sometimes undergoes the

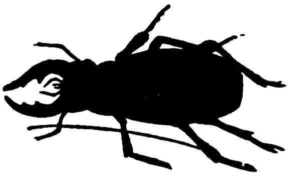


Silk-Worms, p. 152.



Cocoons of Silk-Worm.

Rhinoceros Beetle, p. 197.



Stag Beetle, p. 197

To face p. 160, vol. iv.

great change into an aurelia : but still the fatal intruders work within, and secretly devour its internal substance : soon after they are seen bursting through its skin, and moving away, in order to spin themselves a covering, previous to their own little transformation. It is indeed astonishing sometimes to see the number of worms, and those pretty large, that thus issue from the body of a single caterpillar, and eat their way through its skin : but it is more extraordinary still, that they should remain within the body, devouring its entrails, without destroying its life. The truth is, they seem instructed by Nature not to devour its vital parts ; for they are found to feed only upon that fatty substance which composes the largest part of the caterpillar's body. When this surprising appearance was first observed, it was supposed that the animal thus gave birth to a number of flies, different from itself ; and that the same caterpillar sometimes bred an ichneumon, and sometimes a butterfly : but it was not till after more careful inspection it was discovered, that the ichneumon tribe were not the caterpillar's offspring, but its murderers.

CHAPTER V.

OF THE SILKWORM.

Having mentioned, in the last chapter, the damages inflicted by the caterpillar tribe, we now come to an animal of this kind, that alone compensates for all the mischief occasioned by the rest. This little creature, which only works for itself, has been made of the utmost service to man ; and furnishes him with a covering more beautiful than any other animal can supply. We may declaim indeed against the luxuries of the times, when silk is so generally worn ; but were such garments to fail, what other arts could supply their deficiency.

Though silk was anciently brought in small quantities to Rome, yet it was so scarce as to be sold for its weight in gold ; and was considered as such a luxurious refinement in dress, that it was infamous for a man to appear in habits of which silk formed but half the composition. It was most probably brought among them from the most remotest parts of the east ; since it was, at the time of which I am speaking, scarcely known even in Persia.

Nothing can be more remote from the truth than the manner in which, their historians describe the animal by which silk is produced. Pausanius informs us, that silk came from the country of the Seres, a people of Asiatic Scythia ; in which place an insect, as large as the beetle, but in every other respect resembling a spider, was bred up for that purpose. They take great care, as he assures us, to feed and defend it from the weather ; as well during the summer's heat, as the rigours of winter.—This insect, he observes, makes its web with its feet, of which it has eight in number. It is fed for the space of four years upon a kind of paste, prepared for it ; and at the beginning of the fifth, it is supplied with the leaves of the green willow of which it is particularly fond. It then feeds till it bursts with fat ; after which they take out its bowels, which are spun into the beautiful manufacture so scarce and costly.

The real history of this animal was unknown among the Romans till the times of Justinian; and it is supposed, that silk worms were not brought into Europe till the beginning of the twelfth century; when Roger of Sicily brought workmen in this manufacture from Asia Minor, after his return from his expedition from the Holy Land, and settled them in Sicily and Calabria. From these the other kingdoms of Europe learned this manufacture; and it is now one of the most lucrative carried on among the southern provinces of Europe.

The silkworm is now very well known to be a large caterpillar, of a whitish colour, with twelve feet, and producing a butterfly of the moth kind. The cone on which it spins, is formed for covering it while it continues in the aurelia state; and several of these, properly wound off, and united together, form those strong and beautiful threads, which are woven into silk. The feeding these worms, the gathering, the winding, the twisting, and the weaving their silk, is one of the principal manufactures of Europe; and, as our luxuries increase, seems every day to become more and more necessary to human happiness.

There are two methods of breeding silkworms; for they may be left to grow, and to remain at liberty upon the trees where they are hatched; or they may be kept in a place built for that purpose, and fed every day with fresh leaves. The first method is used in China, Tonquin, and other hot countries; the other is used in those places where the animal has been artificially propagated, and still continues a stranger. In the warm climates, the silkworm proceeds from an egg, which has been glued by the parent moth upon proper parts of the mulberry-tree, and which remains in that situation during the winter. The manner in which they are situated and fixed to the tree, keeps them unaffected by the influence of the weather; so that those frosts which are severe enough to kill the tree, have no power to injure the silkworm.

The insect never proceeds from the egg till Nature has provided it a sufficient supply; and till the budding leaves are furnished in a sufficient abundance, for its support. When the leaves are put forth, the worms seem to feel the genial summons, and bursting from their little eggs, crawl upon the leaves, where they feed with a most voracious appetite. Thus they become larger by degrees; and after some months' feeding, they lay, upon every leaf, small bundles or cones of silk, which appear like so many golden apples, painted on a fine green ground. Such is the method of breeding them in the East; and without doubt it is best for the worms, and least troublesome for the feeder of them. But it is otherwise in our colder European climates; the frequent changes of the weather, and the heavy dews of our evenings, render the keeping them all night exposed, subject to so many inconveniences, as to admit of no remedy. It is true, that, by the assistance of nets, they may be preserved from the insults of birds; but the severe cold weather, which often succeeds the first heats of summer, as well as the rain and high winds, will destroy them all: and therefore, to breed them in Europe, they must be sheltered and protected from every external injury.

For this purpose, a room is chosen, with a south aspect; and the windows are so well glazed, as not to admit the least air: the walls are well built, and the planks of the floor exceedingly close, so as to admit neither birds nor mice, nor even so much as an insect. In the middle there should be four pillars erected, or four wood posts, so placed as to form a pretty large square. Between these are different stories made with osier hurdles; and under each hurdle there should be a floor, with an upright border all round. These hurdles and floors must hang upon pulleys, so as to be placed or taken down at pleasure.

When the worms are hatched, some tender mulberry leaves are provided, and placed in the cloth or paper-box in which the eggs were laid, and which are large enough to hold a great number. When they have acquired some strength, they must be distributed on beds of mulberry leaves, in the different stories of the square in the middle of the room, round which a person may freely pass on every side. They will fix themselves to the leaves, and afterwards to the sticks of the hurdles, when the leaves are devoured. They have then a thread, by which they can suspend themselves on occasion, to prevent any shock by a fall; but this is by no means to be considered as the silk which they spin afterwards in such abundance. Care must be taken that fresh leaves be brought every morning, which must be strewed very gently and equally over them; upon which the silkworms will forsake the remainder of their old leaves, which must be carefully taken away, and every thing kept very clean; for nothing hurts these insects so much as moisture and uncleanliness. For this reason the leaves must be gathered when the weather is dry, and kept in a dry place, if it be necessary to lay in a store. As these animals have but a short time to live, they make use of every moment, and almost continually are spinning, except at those intervals when they change their skins. If mulberry leaves be difficult to be obtained, the leaves of lettuce or hollyoak will sustain them; But they do not thrive so well upon their new diet; and their silk will neither be so copious, nor of so good a quality.

Though the judicious choice and careful management of their diet, is absolutely necessary, yet there is another precaution of equal importance, which is to give them air, and open their chamber windows, at such times as the sun shines warmest. The place also must be kept as clean as possible; not only the several floors that are laid to receive their ordure, but the whole apartments in general. These things well observed, contribute greatly to their health and increase.

The worm, at the time it bursts the shell, is extremely small, and of a black colour; but the head is of a more shining black than the rest of the body; some days after, they begin to turn whitish, or of an ash-coloured gray.—After the skin begins to grow too rigid, or the animal is stinted within it, the insect throws it off and appears clothed anew: it then becomes larger and much whiter, though it has a greenish cast: after some days, which are more or less according to the different heat of the climate, or the quality of the food, it leaves off eating, and seems to sleep for two days together: then it begins to stir, and puts itself into violent motions, till the skin falls off the second time, and is thrown aside by the animal's feet. All these changes are made in three weeks or a month's time; after which it begins to feed once more, still in its caterpillar form, but a good deal differing from itself before its change. In a few days time it seems to sleep again; and, when it awakes, it again changes its clothing, and continues feeding as before. When it has thus taken a sufficiency of food, and its parts are disposed for assuming the aurelia form, the animal forsakes, for the last time, all food and society, and prepares itself a retreat to defend it from external injuries, while it is seemingly deprived of life and motion.

This retreat is no other than its cone, or ball of silk, which Nature has taught it to compose with great art; and within which it buries itself, till it assumes its winged form. This cone or ball is spun from two little longish kinds of bags that lie above the intestines, and are filled with a gummy fluid, of a marigold colour. This is the substance of which the threads are formed; and the little animal is furnished with a surprising apparatus for spinning it to a degree of fineness which its occasions may require. This instrument in some measure resembles a wire-drawer's machine, in which gold or silver threads are drawn to any degree of minuteness; and through this the animal draws its thread with great assiduity. As every thread proceeds from two gum bags, it is probable that each supplies its own; which, however, are united, as they proceed from the animal's body. If we examine the thread with a microscope, it will be found that it is flatted on one side, and grooved along its length: from hence we may infer, that it is doubled just upon leaving the body; and that the two threads stick to each other by that gummy quality of which they are possessed Previous to spinning its web, the silkworm seeks out some convenient place to erect its cell, without any obstruction. When it has found a leaf or a chink fitted to its purpose, it begins to wreathe its head in every direction, and fastens its thread on every side, to the sides of its retreat.—Though all its first essays seem perfectly confused, yet they are not altogether without design: There appears, indeed, no order or contrivance in the disposal of its first threads; they are by no means laid artfully over each other, but are thrown out at random, to serve as an external shelter against rain; for Nature having appointed the animal to work upon trees in the open air, its habits remain, though it is brought up in a warm apartment.

Malpighi pretends to have observed six different layers in a single cone of silk: but what may easily be observed is, that it is composed externally of a kind of rough cotton-like substance, which is called floss; within, the thread is more distinct and even; and next the body of the aurelia, the apartment seems lined with a substance of the hardness of paper, but of a much stronger consistence. It must not be supposed, that the thread which goes to compose the cone, is rolled round, as we roll a bottom; on the contrary, it lies upon it in a very irregular manner, and winds off now from one side of the cone, and then from the other. This whole thread, if measured, will be found about three hundred yards long; and so very fine, that eight or ten of them are generally rolled off into one by the manufacturers. The cone, when completed, is in form like a pigeon's egg, and more pointed at one end than the other; at the smaller end, the head of the aurelia is generally found; and this is the place that the insect, when converted into a moth, is generally seen to burst through.

It is generally a fortnight or three weeks before the aurelia is changed into a moth; but no sooner is the winged insect completely formed, than having divested itself of its aurelia skin, it prepares to burst through its cone, or outward prison: for this purpose it extends its head towards the point of the cone, butts with its eyes, which are rough, against the lining of its cell, wears it away, and at last pushes forward, through a passage which is small at first, but which enlarges as the animal increases its efforts for emancipation; while the tattered remnants of its aurelia skin lie in confusion within the cone, like a bundle of dirty linen.

The animal when thus set free from its double confinement, appears exhausted with fatigue, and seems produced for no other purpose but to transmit a future brood. It neither flies nor eats ; The male only seeking the female, whose eggs he impregnates; and their union continues for four days, without interruption. The male dies immediately after separation from its mate; and she survives him only till she has laid her eggs, which are not hatched into worms till the ensuing spring.

However, there are few of these animals suffered to come to a state of maturity ; for as their bursting through the cone destroys the silk, the manufacturers take care to kill the aurelia by exposing it to the sun, before the moth comes to perfection. This done, they take off the floss, and throw the cones into warm water, stirring them till the first thread offers them a clue for winding all off. They generally take eight of the silken threads together : the cones still kept under water, till a proper quantity of the silk is wound off: however, they do not take all ; for the latter parts grow weak, and are of a bad colour. As to the paper-like substance which remains, some stain it with a variety of colours, to make artificial flowers ; others, let it lie in the water, till the glutinous matter which cements it, is all dissolved ; it is then carded like wool, spun with a wheel, and converted into silk stuffs of an inferior kind.

BOOK IV.

OF INSECTS OF THE FOURTH ORDER.

CHAPTER I.

OF THE FOURTH ORDER OF INSECTS IN GENERAL.

IN the foregoing part we treated of caterpillars changing into butterflies; in the present will be given the history of grubs changing into their corresponding winged animals. These, like the former, undergo their transformation, and appear as grubs or maggots, as aurelias, and at last as winged insects. Like the former, they are bred from eggs; they feed in their reptile state; they continue motionless and lifeless, as aurelias: and fly and propagate, when furnished with wings. But they differ in many respects: the grub or maggot wants the number of feet which the caterpillar is seen to have; the aurelia is not so totally wrapped up, but that its feet and its wings appear. The perfect animal when emancipated, also has its wings either cased, or transparent, like gauze; not coloured with that beautifully painted dust which adorns the wings of the butterfly.

In this class of insects, therefore, me may place a various tribe, that are first laid as eggs, then are excluded as maggots or grubs, then change into aurelias, with their legs and wings not wrapped up, but appearing; and lastly, assuming wings, in which state they propagate their kind. Some of these have four transparent wings, as bees; some have two membranous cases to their wings, as beetles; and some have but two wings, which are transparent, as ants. Here, therefore, we will place the bee the wasp, the humble bee, the ichneumon fly, the gnat, the tipula or long-legs, the beetle, the may-bug, the glow-worm, and the ant. The transformations which all these undergo, are pretty nearly similar; and though very different animals in form, are yet produced nearly in the same manner.

CHAPTER II.

OF THE BEE.

TO give a complete history of this insect in a few pages, which some have exhausted volumes in describing, and whose nature and properties still continue in dispute, is impossible. It will be sufficient to give a general idea of the animal's operations; which though they have been studied for more than two thousand years, are still but incompletely known. The account given us by Reaumur is sufficiently minute; and, if true, sufficiently wonderful: but I find many of the facts, which he relates, doubted by those who are most conversant with bees; and some of them actually declared not to have a real existence in Nature.

It is unhappy, therefore, for those whose method demands a history of bees, that they are unfurnished with those materials which have induced so many observers to contradict so great a naturalist. His life was spent in the contemplation; and it requires an equal share of attention, to prove the error of his discoveries. Without entering, therefore, into the dispute, I will take him for my guide; and just mention, as I go along, those particulars in which succeeding observers have begun to think him erroneous. Which of the two are right, time can only discover; for my part, I have only heard one side, for as yet none have been so bold as openly to oppose Reaumur's delightful researches.

There are three different kinds of bees in every hive. First the labouring bees, which make up the far greatest number, and are thought to be neither male nor female, but merely born for the purposes of labour, and continuing the breed, by supplying the young with provision, while yet in their helpless state. The second sort are the drones; they are of a darker colour, longer, and more thick by one third than the former; they are supposed to be the males; and there is not above a hundred of them in a hive of seven or eight thousand bees. The third sort is much larger than either of the former, and still fewer in number; some assert that there is not above one in every swarm: but this, later observers affirm not to be true, there being sometimes five or six in the same hive. These are called queen bees, and are said to lay all the eggs from which the whole swarm is hatched in a season.

In examining the structure of the common working bee, the first remarkable part that offers is the trunk, which serves to extract the honey from flowers. It is not formed like that of other flies, in the manner of a tube, by which the fluid is to be sucked up; but like a besom, to sweep, or a tongue, to lick it away. The animal is furnished also with teeth, which serve it in making wax. This substance is gathered from flowers, like honey; it consists of that dust or farina which contributes to the fecundation of plants, and is moulded into wax by the little animal at leisure. Every bee when it leaves the hive to collect this precious store, enters into the cup of the flower, particularly such as seem charged with the greatest quantities of this yellow farina. As the animal's body is covered over with hair, it rolls itself within the flower and soon becomes quite covered with the dust, which it soon after brushes off with its two hind-legs and kneads into two little balls. In the thighs of the hind-legs there are two cavities, edged with hair, and into these, as into a basket, the animal sticks its pellets. Thus employed, the bee flies from flower to flower, increasing its store, and adding to its stock of wax; until the ball upon each thigh becomes as big as a grain of pepper; by this time having got a sufficient load, it returns, making the best of its way to the hive.

The belly of the bee is divided into six rings, which sometimes shorten the body, by slipping one over the other. It contains within it, beside the intestines, the honey-bag, the venom-bag, and the sting. The honey-bag is as transparent as crystal, containing the honey that the bee has brushed from the flowers; of which the greater part is carried to the hive, and poured into the cells of the honey-comb; while the remainder serves for the bee's own nourishment: for, during summer, it never touches what has been laid up for the winter. The sting, which serves to defend this little animal from its enemies, is composed of three parts; the sheath and two darts, which are extremely small and penetrating. Both the darts have several small points or barbs, like those of a fish-hook, which render the sting more painful, and makes the darts rankle in the wound. Still, however, this instrument would be very slight, did not the bee poison the wound. The sheath which has a sharp point, makes the first impression; which is followed by that of the darts, and then the venomous liquor is poured in. The sheath sometimes sticks so fast in the wound, that the animal is obliged to leave it behind; by which the bee soon after dies, and the wound is considerably inflamed. It might at first appear well for mankind, if the bee were without its sting; but, upon recollection, it will be found that the little animal would have then too many rivals in sharing its labours. A hundred other lazy animals, fond of honey, and hating labour would intrude upon the sweets of the hive; and the treasure would be carried off for want of armed guardians to protect it.

From examining the bee singly, we now come to consider it in society, as an animal not only subject to laws, but active, vigilant, laborious, and disinterested. All its provisions are laid up for the community; and all its arts in building a cell designed for the benefit of posterity. The substance with which these bees build their cells is wax; which is fashioned into convenient apartments for themselves and their young. When they begin to work in their hives, they divide themselves into four companies: one of which roves in the fields in search of materials; another employs itself in laying out the bottom and partitions of their cells; a third is employed in making the inside smooth from the corners and angles; and the fourth company bring food for the rest, or relieve those who return with their respective burdens. But they are not kept constant to one employment; they often change the task assigned them; those that have been at work being permitted to go abroad; and those that have been in the fields already take their places. They seem even to have signs, by which they understand each other; for when any of them wants food, it bends down its trunk to the bee from whom it is expected, which then opens its honey-bag, and lets some drops fall into the other's mouth, which is at that time open to receive it. Their diligence and labour is so great, that in a day's time they are able to make cells which lie upon each other, numerous enough to contain three thousand bees.

If we examine their cells, they will be found formed in the exactest proportion. It was said by Pappus an ancient geometrician, that, of all other figures, hexagons were the most convenient; for when placed touching each other the most convenient room would be given, and the smallest lost. The cells of the bees are perfect hexagons; these, in every honey-comb, are double, opening on either side, and closed at the bottom. The bottoms are composed of little triangular panes, which, when united together, terminate in a point, and lie exactly upon the extremities of other panes of the same shape, in opposite cells. These lodgings have spaces, like streets, between them, large enough to give the bees a free passage in and out; and yet narrow enough to preserve the necessary heat. The mouth of every cell is defended by a border, which makes the door a little less than the inside of the cell, which serves to strengthen the whole. These cells serve for different purposes: for laying up their young; for their wax, which in winter becomes a part of their food; and for their honey, which makes their principal subsistence.

It is well known that the habitation of bees ought to be very close; and what their hives want, from the negligence or unskilfulness of man, these animals supply by their own industry; so that it is their principal care, when first hived, to stop up all the crannies. For this purpose they make use of a resinous gum, which is more tenacious than wax, and differs greatly from it. This the ancients called *propolis*: it will grow considerably hard in June; though it will in some measure soften by heat; and is often found different in consistence, colour, and smell. It has generally an agreeable aromatic odour when it is warmed; and by some it is considered as a most grateful perfume. When the bees begin to work with it, it is soft, but it acquires a firmer consistence every day; till at length it assumes a brown colour, and becomes much harder than wax. The bees carry it on their hinder legs; and some think it is met with on the birch, the willow, and the poplar. However it is procured, it is certain that they plaster the inside of their hives with this composition.

If examined through a glass hive, from the hurry the whole swarm is in, the whole appears at first, like anarchy and confusion: but the spectator soon finds every animal diligently employed, and following one pursuit, with a settled purpose. Their teeth are the instruments by which they model and fashion their various buildings, and give them such symmetry and perfection. They begin at the top of the hive; and several of them work at a time, at the cells which have two faces. If they are stinted with regard to time, they give the new cells but half the depth which they ought to have; leaving them imperfect, till they have sketched out the number of cells necessary for the present occasion. The construction of their combs, costs them a great deal of labour: they are made by insensible additions; and not cast at once in a mould, as some are apt to imagine. There seems no end to their shaping, finishing, and turning them neatly up. The cells for their young are most carefully formed; those designed for lodging the drones, are larger than the rest; and that for the queen-bee, the largest of all. The cells in which the young brood are lodged, serve at different times for containing honey; and this proceeds from an obvious cause: every worm before it is transformed into an aurelia, hangs its old skin on the partitions of its cell; and thus while it strengthens the wall, diminishes the capacity of its late apartment. The same cell, in a single summer is often tenanted by three or four worms in succession; and the next season, by three or four more. Each worm takes particular care to fortify the pannels of its cell, by hanging up its spoils there: thus, the partitions being lined, six or eight deep, become at last oo narrow for a new brood, and are converted into store-houses, for honey

Those cells where nothing but honey is deposited, are much deeper than the rest When the harvest of honey is so plentiful that they have not sufficient room for it, they either lengthen their combs, or build more: which are much longer than the former. Sometimes they work at three combs at a time; for when there are three work-houses, more bees may be thus employed, without embarrassing each other.

But honey, as was before observed, is not the only food upon which these animals subsist. The meal of flowers, of which their wax is formed, is one of their most favourite repasts. This is a diet which they live upon during the summer; and of which they lay up a large winter provision. The wax of which their combs are made, is no more than this meal digested, and wrought into a paste. When the flowers upon which bees generally feed, are not fully blown, and this meal or dust is not offered in sufficient quantities, the bees pinch the tops of the stamina in which it is contained, with their teeth; and thus anticipate the progress of vegetation. In April and May, the bees are busy, from morning to evening, in gathering this meal; but when the weather becomes too hot in the midst of summer, they work only in the morning.

The bee is furnished with a stomach for its wax, as well as its honey. In the former of the two, their powder is altered, digested, and concocted into real wax; and is thus ejected by the same passage by which it was swallowed. Every comb, newly made, is white: but it becomes yellow as it grows old, and almost black when kept too long in the hive. Beside the wax thus digested, there is a large portion of the powder kneaded up for food in every hive, and kept in separate cells, for winter provision. This is called, by the country people, bee-bread; and contributes to the health and strength of the animal, during winter. Those who rear bees, may rob them of their honey, and feed them, during the winter, with treacle; but no proper substitute has yet been found for the bee-bread; and, without it, the animals become consumptive and die.

As for the honey, it is extracted from that part of the flower called the nectareum. From the mouth this delicious fluid passes into the gullet; and then into the first stomach, or honey-bag, which, when filled, appears like an oblong bladder. Children, that live in country places, are well acquainted with this bladder; and destroy many bees to come at their store of honey. When a bee has sufficiently filled its first stomach, it returns back to the hive, where it disgorges the honey into one of the cells. It often happens that the bee delivers its store to some other, at the mouth of the hive, and flies off for a fresh supply. Some honeycombs are always left open for common use; but many others are stopped up, till there is a necessity of opening them. Each of these is covered carefully with wax; so close, that the covers seem to be made at the very instant the fluid is deposited within them.

Having thus given a cursory description of the insect, individually considered, and of the habitation it forms, we next come to its social habits and institutions: and, in considering this little animal attentively, after the necessary precautions for the immediate preservation of the community, its second care is turned to the continuance of posterity. How numerous soever the multitude of bees may appear in one swarm, yet they all owe their origin to a single parent, which is called the *Queen-Bee*. It is indeed surprising that a single insect shall, in one summer, give birth to above twenty thousand young: but, upon opening the body, the wonder will cease; as the number of eggs appearing, at one time, amounts to five thousand. This animal, whose existence is of such importance to her subjects, may easily be distinguished from the rest, by her size, and the shape of her body. On her safety depends the whole welfare of the commonwealth; and the attentions paid her by all the rest of the swarm, evidently show the dependence her subjects have upon her security. If this insect be carefully observed, she will be seen at times attended with a numerous retinue, marching from cell to cell, plunging the extremity of her body into many of them, and leaving a small egg in each.

The bees which generally compose her train, are thought to be males, which serve to impregnate her by turns. These are larger and blacker than the common bees; without stings, and without industry. They seem formed only to transmit a posterity; and to attend the queen, whenever she thinks proper to issue from the secret retreats of the hive, where she most usually resides. Upon the union of these two kinds depends all expectations of a future progeny; for the working bees are of no sex, and only labour for another offspring: yet such is their attention to their queen, that if she happens to die, they will leave off working, and take no farther care of posterity. If, however, another queen is, in this state of universal despair, presented them, they immediately acknowledge her for their sovereign, and once more diligently apply to their labour. It must be observed, however, that all this fertility of the queen-bee, and the great attentions paid to her by the rest, are controverted by more recent observers. They assert, that the common bees are parents themselves; that they deposit their eggs in the cells which they have prepared; that the females are impregnated by the males, and bring forth a progeny, which is wholly their own.

However, to go on with their history, as delivered us by Mr. Reaumur. When the queen-bee has deposited the number of eggs necessary in the cells, the working bees undertake the care of the rising posterity. They are seen to leave off their usual employments; to construct proper receptacles for eggs; or to complete these that are already formed. They purposely build little cells, extremely solid, for the young; in which they employ a great deal of wax: those designed for lodging the males, as was already observed, are larger than the rest; and those for the queen-bees the largest of all. There is usually but one egg deposited in every cell; but when the fecundity of the queen is such, that it exceeds the number of cells already prepared, there are sometimes three or four eggs crowded together in the same apartment. But this is an inconvenience that the working bees will by no means suffer. They seem sensible that two young ones, stuffed up in the same cell, when they grow larger, will but embarrass and at last destroy each other: they therefore take care to leave a cell to every egg; and remove, or destroy the rest.

The single egg that is left remaining, is fixed at the bottom of the cell, and touches it but in a single point. A day or two after it is deposited, the worm is excluded from the shell of the egg, having the appearance of a maggot rolled up in a ring, and lying softly on a bed of a whitish coloured jelly; upon which also the little animal begins to feed. In the mean time, the instant it appears, the working bees attend it with the mos anxious and parental tenderness; they furnish it every hour with a supply of this whitish substance, on which it feeds and lies; and watch the cell with unremitting care. They are nurses that have greater affection for the offspring of others, than many parents have for their own children. They are constant in visiting each cell, and seeing that nothing is wanting; preparing the white mixture, which is nothing but a composition of honey and wax, in their own bowels, with which they feed them. Thus attended, and plentifully fed, the worm, in less than six days time, comes to its full growth, and no longer accepts the food offered it. When the bees perceive that it has no further occasion for feeding, they perform the last offices of tenderness, and shut the little animal up in its cell; walling up the mouth of its apartment with wax: there they leave the worm to itself; having secured it from every external injury.

The worm is no sooner left inclosed, but, from a state of inaction, it begins to labour, extending and shortening its body; and by this means lining the walls of its apartment with a silken tapestry, which it spins in the manner of caterpillars, before they undergo their last transformation. When their cell is thus prepared, the animal is soon after transformed into an aurelia; but differing from that of the common caterpillar, as it exhibits not only the legs, but the wings of the future bee, in its present state of inactivity. Thus, in about twenty, or one and twenty days after the egg was laid, the bee is completely formed, and fitted to undergo the fatigues of its state. When all its parts have acquired their proper strength and consistence, the young animal opens its prison, by piercing with its teeth the waxen door that confines it. When just free from its cell, it is as yet moist, and incommoded with the spoils of its former situation; but the officious bees are soon seen to flock round it, and to lick it clean on all sides with their trunks; while another band, with equal assiduity, are observed to feed it with honey; others again begin immediately to cleanse the cell that has been just left; to carry the ordures out of the hive, and to fit the place for a new inhabitant. The young bee soon repays their care, by its industry; for as soon as ever its external parts become dry, it discovers its natural appetites for labour, and industriously begins the task, which it pursues unremittingly through life. The toil of man is irksome to him, and he earns his subsistence with pain; but this little animal seems happy in its pursuits, and finds delight in all its employments.

When just freed from the cell, and properly equipped by its fellow bees for duty, it at once issues from the hive, and instructed only by Nature, goes in quest of flowers, chooses only those that yield it a supply, rejects such as are barren of honey, or have been already drained by other adventurers; and when loaded, is never at a loss to find its way back to the common habitation. After this first sally, it begins to gather the mealy powder, that lies on ever flower, which is afterwards converted into wax; and with this, the very first day, it returns with two large balls stuck to its thighs.

When bees first begin to break their prisons, there are generally above a hundred excluded in one day. Thus, in the space of a few weeks, the number of the inhabitants of one hive of moderate size, becomes so great, that there is no place to contain the new comers; and they are scarcely excluded from the cell, when they are obliged, by the old bees, to sally forth in quest of new habitations. In other words, the hive begins to swarm, and the new progeny prepares for exile.

While there is room enough in the hive, the bees remain quietly together; it is necessity alone that compels the separation. Sometimes, indeed, the young brood, with graceless obstinacy, refuse to depart, and even venture to resist their progenitors. The young ones are known by being browner than the old, with whiter hair; the old ones are of a lighter colour, with red hair. The two armies are therefore easily distinguishable, and dreadful battles are often seen to ensue. But the victory almost ever terminates with strict poetical justice in favour of the veterans, and the rebellious offspring are driven off, not without loss and mutilation.

In different countries, the swarms make their appearance at different times of the year, and there are several signs previous to this intended migration. The night before, an unusual buzzing is heard in the hive; in the morning though the weather be soft and inviting, they seem not to obey the call, being intent on more important meditations within.—All labour is discontinued in the hive, every bee is either employed in forcing, or reluctantly yielding a submission; at length, after some noise and tumult, a queen bee is chosen to guard rather than conduct the young colony to other habitations, and then they are marshalled without any apparent conductor. In less than a minute they leave their native abode, and forming a cloud round their protectress, they set off, without seeming to know the place of their destination; *The world before them, where to choose their place of rest.* The usual time of swarming is from ten in the morning to three in the afternoon, when the sun shines bright, and invites them to seek their fortunes. They flutter for awhile in the air, like flakes of snow, and sometimes undertake a distant journey, but more frequently are contented with some neighbouring asylum; the branch of a tree, a chimney-top, or some other exposed situation. It is, indeed, remarkable, that all these animals, of whatever kind, that have long been under the protection of man, seem to lose a part of their natural sagacity, in providing for themselves. The rabbit when domesticated forgets to dig holes, the hen to build a nest, and the bee to seek a shelter that shall protect it from the inclemencies of winter. In those countries, where the bees are wild, and unprotected by man, they are always sure to build their waxen cells in the hollow of a tree; but with us, they seem improvident in their choice, and the first green branch that stops their flight, seems to be thought sufficient for their abode through winter. However, it does not appear that the queen chooses the place where they are to alight, for many of the stragglers, who seem to be pleased with a particular branch, go and settle upon it; others are seen to succeed; and, at last, the queen herself, when she finds a sufficient number there before her, goes to make it the place of her head quarters. When the queen is settled, the rest of the swarm soon follow; and, in about a quarter of an hour, the whole body seem to be at ease. It sometimes is found, that there are two or three queens to a swarm and the colony is divided into parties; but it most usually happens, that one of these is more considerable than the other, and the bees, by degrees, desert the weakest, to take shelter under the most powerful protector. The deserted queen does not long survive this defeat; she takes refuge under the new monarch, and is soon destroyed by her jealous rival. Till this cruel execution is performed, the bees never go out to work; and if there should be a queen bee belonging to the new colony left in the old hive, she always undergoes the fate of the former. However, it must be observed, that the bees never sacrifice any of their queens, when the hive is full of wax and honey; for there is at that time no danger in maintaining a plurality of breeders.

When the swarm is thus conducted to a place of rest, and the policy of government is settled, the bees soon resume their former labours. The making cells, storing them with honey, impregnating the queen, making proper cells for the reception of the rising progeny, and protecting them from external danger, employ their unceasing industry. But soon after, and towards the latter end of summer, when the colony is sufficiently stored with inhabitants, a most cruel policy ensues. The drone bees, which are (as has been said) generally in a hive, to the number of a hundred, are marked for slaughter. These, which had hitherto led a life of indolence and pleasure, whose only employment was in impregnating the queen, and rioting upon the labours of the hive, without aiding in the general toil, now share the fate of most voluptuaries, and fall a sacrifice to the general resentment of society.

The working bees in a body declare war against them; and in two or three days time, the ground all round the hive is covered with their dead bodies. Nay, the working bees will even kill such drones, as are yet in the worm state, in the cell, and eject their bodies from the hive, among the general carnage.

When a hive sends out several swarms in a year, the first is always the best, and the most numerous. These, having the whole summer before them, have the more time for making wax and honey, and consequently their labours are the most valuable to the proprietor. Although the swarm chiefly consists of the youngest bees, yet it is often found that bees of all ages compose the multitude of emigrants, and it often happens, that bees of all ages are seen remaining behind. The number of them is always more considerable than that of some populous cities, for sometimes upwards of forty thousand are found in a single hive. So large a body may well be supposed to work with great expedition; and in fact, in less than twenty four hours, they will make combs above twenty inches long, and seven or eight broad. Sometimes they will half fill their hives with wax in less than five days. In the first fifteen days, they are always found to make more wax than they do afterwards during the rest of the year.

Such are the outlines of the natural history of these animals, as usually found in our own country. How they are treated, so as to produce the greatest quantity of honey, belongs rather to the rural economist, than the natural historian; volumes have been written on the subject, and still more remains equally curious and new. One thing, however, it may be proper to observe, that a farm, or a country may be over-stocked with bees, as well as with any other sort of animal; for a certain number of hives, always require a certain number of flowers to subsist on. When the flowers near home are rifled, then are these industrious insects seen taking more extensive ranges; but their abilities may be over-taxed; and if they are obliged, in quest of honey, to go too far from home, they are over-wearied in the pursuit, they are devoured by birds, or beat down by the winds and rain.

From a knowledge of this, in some parts of France and Piedmont, they have contrived, as I have often seen, a kind of floating bee-house.

They have on board one barge three score or a hundred bee-hives, well defended from the inclemency of an accidental storm; and with these the owners suffer themselves to float gently down the river. As the bees are continually choosing their flowery pasture along the banks of the stream, they are furnished with sweets before unrifled; and thus a single floating bee-house, yields the proprietor a considerable income. Why a method similar to this has never been adopted in England, where we have more gentle rivers, and more flowery banks, than in any other part of the world, I know not; certainly it might be turned to advantage, and yield the possessor a secure, though perhaps a moderate income.

Having mentioned the industry of these admirable insects, it will be proper to say something of the effects of their labour, of that wax and honey which are turned by man to such various uses. Bees gather two kinds of wax, one coarse and the other fine. The coarser sort is bitter, and with this, which is called *propolis*, they stop up all the holes and crevices of their hives. It is of a more resinous nature than the fine wax, and is consequently better qualified to resist the moisture of the season, and preserve the works warm and dry within. The fine wax is as necessary to the animal's preservation as the honey itself. With this they make their lodgings, with this they cover the cells of their young, and in this they lay up their magazines of honey. This is made, as has been already observed, from the dust of flowers, which is carefully kneaded by the little insect, then swallowed, and having undergone a kind of digestion, is formed into the cells, which answer such a variety of purposes. To collect this, the animal rolls itself in the flower it would rob, and thus takes up the vegetable dust with the hair of its body; then carefully brushing it into a lump, with its fore-paws it thrusts the composition into two cavities behind the thighs, which are made like spoons to receive the wax, and the hair that lines them serves to keep it from falling.

As of wax, there are also two kinds of honey; the white and the yellow. The white is taken without fire from the honey-combs. The yellow is extracted by heat, and squeezed through bags, in a press. The best honey is new, thick, and granulated, of a clear transparent white colour, of a soft aromatic smell, and of a sweet and lively taste. Honey made in mountainous countries, is preferable to that of the valley. The honey made in the spring, is more highly esteemed than that gathered in summer, which last is still more valuable than that of autumn, when the flowers begin to fade and lose their fragrance.

The bees are nearly alike in all parts of the world, yet there are differences worthy of our notice. In Gaudaloupe, the bee is less by one half than the European, and more black and round. They have no sting, and make their cells in hollow trees; where, if the hole they meet with is too large, they form a sort of waxen house of the shape of a pear, and in this they lodge and store their honey, and lay their eggs. They lay up their honey in waxen vessels, of the size of a pigeon's egg, of a black or deep violet colour; and these are so joined together, that there is no space left between them. The honey never congeals, but is fluid, of the consistence of oil, and the colour of amber. Resembling these, there are found little black bees, without a sting, in all the tropical climates; and though these countries are replete with bees, like our own, yet those form the most useful and laborious tribe in that part of the world. The honey they produce is neither so unpalatable, nor so surfeiting as ours; and the wax is so soft, that it is only used for medicinal purposes, it being never found hard enough to form into candles, as in Europe.

Of insects, that receive the name of bees, among us, there are several; which, however, differ widely from that industrious, social race we have been just describing. The Humble Bee is the largest of all this tribe, being as large as the first joint of one's middle finger. These are seen in every field, and perched on every flower. They build their nest in holes in the ground, of dry leaves, mixed with wax and wool, defended with moss from the weather. Each humble-bee makes a separate cell about the size of a small nutmeg, which is round and hollow, containing the honey in a bag. Several of these cells are joined together, in such a manner, that the whole appears like a cluster of grapes. The females, which have the appearance of wasps, are very few, and their eggs are laid in cells, which the rest soon cover over with wax. It is uncertain whether they have a queen or not; but there is one much larger than the rest, without wings and without hair, and all over black, like polished ebony. This goes and views all the works from time to time, and enters into the cell, as if it wanted to see whether every thing was done right: In the morning, the young humble bees are very idle, and seem not at all inclined to labour, till one of the largest, about seven o'clock, thrusts half its body from a hole designed for that purpose, and seated on the top of the nest, beats its wings for twenty minutes successively, buzzing the whole time, till the whole colony is put in motion. The humble-bees gather honey, as well as the common bees; but it is neither so fine, nor so good, nor the wax so clean, or so capable of fusion.

Besides the bees already mentioned, there are various kinds among us, that have much the appearance of honey-makers, and yet make only wax. The Wood-Bee is seen in every garden. It is rather larger than the common queen bee; its body is of a bluish black, which is smooth and shining. It begins to appear at the approach of spring, and is seen flying near walls exposed to a sunny aspect. This bee makes its nest in some piece of wood, which it contrives to scoop and hollow for its purpose. This, however, is never done in trees that are standing, for the wood it makes choice of is half rotten. The holes are not made directly forward, but turning to one side, and have an opening sufficient to admit one's middle finger, from whence runs the inner apartment, generally twelve or fifteen inches long. The instruments used in boring these cavities, are their teeth; the cavity is usually branched into three or four apartments; and in each of these they lay their eggs to the number of ten or twelve, each separate and distinct from the rest. The egg is involved in a sort of paste, which serves at once for the young animal's protection and nourishment. The grown bees, however, feed upon small insects, particularly a louse, of a reddish brown colour, of the size of a small pin's head.

Mason Bees make their cells with a sort of mortar made of earth, which they build against a wall that is exposed to the sun. The mortar, which at first is soft, soon becomes as hard as stone, and in this their eggs are laid. Each nest contains seven or eight cells, an egg in every cell, placed regularly one over the other. If the nest remains unhurt, or wants but little repairs, they make use of them the year ensuing: and thus they often serve three or four years successively. From the strength of their houses, one would think these bees in perfect security, yet none are more exposed than they. A worm with very strong teeth, is often found to bore into their little fortifications, and devour their young.

The Ground-Bee builds its nest in the earth, wherein they make round holes, five or six inches deep; the mouth being narrow, and only just sufficient to admit the little inhabitant.

It is amusing enough to observe the patience and assiduity with which they labour. They carry out all the earth, grain by grain, to the mouth of the hole, where it forms a little hillock; an Alps compared to the power of the artist by which it is raised. Sometimes the walks of a garden are found undermined by their labours; some of the holes running directly downward, others horizontally beneath the surface. They lay up in these cavities provisions for their young, which consist of a paste that has the appearance of corn, and is of a sweetish taste.

The Leaf-cutting Bees, make their nest and lay their eggs among bits of leaves, very artificially placed in holes in the earth, of about the length of a tooth-pick case. They make the bits of leaves of a roundish form, and with them line the inside of their habitations. This tapestry is still further lined by a reddish kind of paste, somewhat sweet or acid. These bees are of various kinds; those that build their nests with chesnut-leaves are as big as drones, but those of the rose tree are smaller than the common bee.

The Wall Bees are so called, because they make their nests in walls, of a kind of silky membrane, with which they fill up the vacancies between the small stones which form the sides of their habitation. Their apartment consists of several cells placed end to end, each in the shape of a woman's thimble. Though the web which lines this habitation, is thick and warm, yet it is transparent and of a whitish colour. This substance is supposed to be spun from the animal's body. The males and females are of a size, but the former are without a sting. To these varieties of the bee kind might be added several others, which are all different in nature, but not sufficiently distinguished to excite curiosity.

CHAPTER III.

OF THE WASP.

HOWEVER similar many insects may be in appearance, this does not imply a similitude in their history. The bee and the wasp resemble each other very strongly, yet, in examining their manner and their duration, they differ very widely; the bee labours to lay up honey, and lives to enjoy the fruits of its industry: the wasp appears equally assiduous; but only works for posterity, as the habitation is scarcely completed when the inhabitant dies.

The wasp is well known to be a winged insect with a sting. To be onger in proportion to its bulk than the bee, to be marked with bright yellow circles round its body, and to be the most swift and active insect of all the fly kind. On each side of the mouth this animal is furnished with a long tooth, notched like a saw, and with these it is enabled to cut any substance, not omitting meat itself, and to carry it to its nest. Wasps live like bees in community, and sometimes ten or twelve thousand are found inhabiting a single nest.

Of all other insects the wasp is the most fierce, voracious, and most dangerous, when enraged. They are seen wherever flesh is cutting up, gorging themselves with the spoil, and then flying to their nests with their reeking prey. They make war also on every other fly, and the spider himself dreads their approaches.

Every community among bees is composed of females or queens, drones or males, and neutral or working-bees. Wasps have similar occupations; the two first are for propagating the species, the last for nursing, defending and supporting the rising progeny. Among bees, however, there is seldom above a queen or two in a hive; among wasps there are above two or three hundred.

As soon as the summer begins to invigorate the insect tribes, the wasps are most active of the number, and diligently employed either in providing provisions for their nest, if already made, or in making one, if the former habitation be too small to receive the increasing community. The nest is one of the most curious objects in natural history, and contrived almost as artificially as that of the bees themselves. Their principal care is to seek out a hole that has been begun by some other animal, a field-mouse, a rat, or a mole, to build their nests in. They sometimes build upon the plain, where they are sure of the dryness of their situation, but most commonly on the side of a bank, to avoid the rain or water that would otherwise annoy them. When they have chosen a proper place, they go to work with wonderful assiduity. The first labour is to enlarge and widen the hole, taking away the earth, and carrying it off to some distance. They are perfectly formed for labour, being furnished with a trunk above their mouths, two saws on each side, which play to the right and left against each other, and six strong muscular legs to support them. They cut the earth into small parcels with their saws, and carry it out with their legs or paws. This is the work of some days; and at length the outline of their habitation is formed, making a cavity of about a foot and a half every way. While some are working in this manner, others are roving the fields to seek out materials for their building. To prevent the earth from falling down and crushing their rising city into ruin, they make a sort of roof with their gluey substance, to which they begin to fix the rudiments of their building, working from the top downwards, as if they were hanging a bell, which, however, at length they close at the bottom. The materials with which they build their nests are bits of wood and glue.—The wood they get where they can from the rails and posts which they meet with in the fields and elsewhere. These they saw and divide into a multitude of small fibres, of which they take up little bundles in their claws, letting fall upon them a few drops of gluey matter, with which their bodies are provided, by the help of which they knead the whole composition into a paste, which serves them in their future building. When they have returned with this to their nest, they stick their load of paste on that part where they make their walls and partitions; they tread it close with their feet, and trowel it with their trunks, still going backwards as they work. Having repeated this operation three or four times, the composition is at length flatted out until it becomes a small leaf of a gray colour, much finer than paper, and of a pretty firm texture. This done, the same wasp returns to the field to collect a second load of paste, repeating the same several times, placing layer upon layer, and strengthening every partition in proportion to the wants or convenience of the general fabric. Other working wasps come quickly after to repeat the same operation, laying more leaves upon the former, till at length, after much toil, they have finished the large roof which is to secure them from the tumbling in of the earth. This dome being finished, they make another entrance to their habitation, designed either for letting in the warmth of the sun or for escaping in case one door be invaded by plunderers. Certain, however, it is, that by one of these they always enter, by the other they sally forth to their toil; each hole being so small that they can pass but one at a time. The walls being thus composed, and the whole somewhat of the shape of a pear, they labour at their cells, which they compose of the same paper-like substance that goes to the formation of the outside works. Their combs differ from those of bees, not less in the composition than the position which they are always seen to obtain. The honey-comb of the bee is edgeways with respect to the hive; that of the wasp is flat, and the mouth of every cell opens downwards. Thus is their habitation contrived, story above story, supported by several rows of pillars which give firmness to the whole building, while the upper story is flat-roofed, and as smooth as the pavement of a room, laid with squares of marble. The wasps can freely walk upon these stories between the pillars to do whatever their wants require. The pillars are very hard and compact, being larger at each end than in the middle, not much unlike the columns of a building. All the cells of the nest are only destined for the reception of the young, being replete with neither wax nor honey.

Each cell is like that of the bee, haxagonal; but they are of two sorts, the one larger for the production of the male and female wasps, the other less, for the reception of the working part of the community. When the females are impregnated by the males, they lay their eggs, one in each cell and stick it in with a kind of gummy matter to prevent its falling out From this egg proceeds the insect in its worm state, of which the old ones are extremely careful, feeding it from time to time till it becomes large and entirely fills up its cell. But the wasp community differs from that of the bee in this; that among the latter the working bees take the parental duties upon them, whereas among the wasps the females alone are permitted to feed their young, and to nurse their rising progeny. For this purpose the female waits with great patience till the working wasps have brought in their provisions, which she takes from them, and cuts into pieces. She then goes with great composure from cell to cell, and feeds every young one with her mouth. When the young worms have come to a certain size they leave off eating, and begin to spin a very fine silk, fixing the first end to the entrance of the cell, then turning their heads, first on one side then on the other, they fix the threads to different parts, and thus they make a sort of a door, which serves to close up the mouth of the cell. After this they divest themselves of their skins after the usual mode of transformation; the aurelia, by degrees, begins to emancipate itself from its shell; by little and little, it thrusts out its legs and wings, and insensibly acquires the colour and shape of its parent.

The wasp thus formed, and prepared for depredation, becomes a bold, troublesome, and dangerous insect: there are no dangers which it will not encounter in pursuit of its prey, and nothing seems to satiate its gluttony. Though it can gather no honey of its own, no animal is more fond of sweets. For this purpose, it will pursue the bee and the humble bee, destroy them with its sting, and then plunder them of their honey-bag, with which it flies triumphantly loaded to its nest to regale its young. Wasps are ever fond of making their nests in the neighbourhood of bees, merely to have an opportunity of robbing their hives, and feasting on the spoil. Yet the bees are not found always patiently submissive to their tyranny, but fierce battles are sometimes seen to ensue, in which the bees make up by conduct and numbers what they want in personal prowess. When there is no honey to be had, they seek for the best and sweetest fruits, and they are never mistaken in their choice From the garden they fly to the city, to the grocers' shops, and butchers shambles. They sometimes will carry off bits of flesh half as big as themselves, with which they fly to their nest for the nourishment of their brood. Those who cannot drive them away, lay for them a piece of ox's liver, which being without fibres, they prefer to other flesh; and whenever they are found, all other flies are seen to desert the place immediately. Such is the dread with which these little animals impress all the rest of the insect tribes, which they seize and devour without mercy, that they vanish at their approach. Wherever they fly, like the eagle or the falcon, they form a desert in the air around them. In this manner the summer is passed in plundering the neighbourhood, and rearing up their young; every day adds to their numbers; and from their strength, agility, and indiscriminate appetite for every kind of provision, were they as long-lived as the bee, they would soon swarm upon the face of Nature, and become the most noxious plague of man; but providentially their lives are measured to their mischief, and they live but a single season.

While the summer heats continue, they are bold, voracious, and enterprising; but as the sun withdraws, it seems to rob them of their courage and activity. In proportion as the cold increases, they are seen to become more domestic; they seldom leave the nest, they make but short adventures from home, they flutter about in the noon-day heats, and soon after return chilled and feeble.

As their calamities increase, new passions soon begin to take place, the care for posterity no longer continues; and as the parents are no longer able to provide their growing progeny a supply, they take the barbarous resolution of sacrificing them all to the necessity of the times. In this manner, like a garrison upon short allowance, all the useless hands are destroyed; the young worms, which a little before they fed and protected with so much assiduity, are now butchered and dragged from their cells. As the cold increases they no longer find sufficient warmth in their nests, which grow hateful to them, and they fly to seek it in the corners of houses, and places that receive an artificial heat. But the winter is still insupportable; and, before the new year begins, they wither and die; the working wasps first, the males soon following, and many of the females suffer in the general calamity. In every nest, however, one or two females survive the winter, and having been impregnated by the male during the preceding season, she begins in spring to lay her eggs in a little hole of her own contrivance. This bundle of eggs which is clustered together like grapes, soon produces two worms, which the female takes proper precaution to defend and supply, and these, when hatched, soon give assistance, to the female, who is employed in hatching two more; these also gathering strength, extricate themselves out of the web that inclosed them, and become likewise assistants to their mother; fifteen days after, two more make their appearance; thus is the community every day increasing, while the female lays in every cell, first a male and then a female. These soon after become breeders in turn, till, from a single female, ten thousand wasps are seen produced before the month of June. After the female has thus produced her progeny, which are distributed in different districts, they assemble from all parts in the middle of summer, and provide for themselves the large and commodious habitation, which has been described above.

Such is the history of the social wasp; but, as among bees, so also among these insects, there are various tribes that live in solitude; these lay their eggs in a hole for the purpose, and the parent dies long before the birth of its offspring. In the principal species of the Solitary Wasps, the insect is smaller than the working wasp of the social kind. The filament by which the corselet is joined to the body, is longer and more distinctly seen and, the whole colour of the insect is blacker than in the ordinary kinds. But it is not their figure, but the manners of this extraordinary insect that claim our principal regard.

From the end of May to the beginning of July, this wasp is seen most diligently employed. The whole purpose of its life seems to be in contriving and fitting up a commodious apartment for its young one, which is not to succeed it till the year ensuing. For this end it is employed, with unwearied assiduity, in boring a hole in the finest earth some inches deep, but not much wider than the diameter of its own body. This is but a gallery leading to a wider apartment destined for the convenient lodgment of its young.—As it always chooses a gravelly soil to work in, and where the earth is almost as hard as stone itself, the digging and hollowing this apartment is an enterprise of no small labour: for effecting its operations, this insect is furnished with two teeth, which are strong and firm, but not sufficiently hard to penetrate the substance through which it is resolved to make its way. In order, therefore, to soften that earth which it is unable to pierce, it is furnished with a gummy liquor which it emits upon the place, and which renders it more easily separable from the rest, and the whole becoming a kind of soft paste, is removed to the mouth of the habitation. The animal's provision of liquor in these operations is however soon exhausted; and it is then seen either taking up water from some neighbouring flower or stream in order to supply the deficiency.

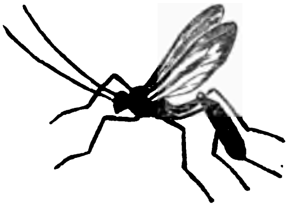
At length, after much toil, a hole some inches deep is formed, at the bottom of which is a large cavity; and to this no other hostile insect would venture to find its way, from the length and the narrowness of the defile through which it would be obliged to pass. In this the solitary wasp lays its egg, which is destined to continue the species; there the nascent animal is to continue for above nine months, unattended and immured, and, at first appearance, the most helpless insect of the creation. But when we come to examine, new wonders offer, no other insect can boast so copiously luxurious a provision, or such confirmed security.

As soon as the mother wasp has deposited her egg at the bottom of the hole, her next care is to furnish it with a supply of provisions, which may be offered to the young insect, as soon as it leaves the egg. To this end she procures a number of little green worms, generally from eight to twelve, and these are to serve as food for the young one the instant it awakens into life. When this supply is regularly arranged and laid in, the old one then, with as much assiduity as it before worked out its hole, now closes the mouth of the passage; and thus leaving its young one immured in perfect security, and in a copious supply of animal food, she dies satisfied with having provided for a future progeny.

When the young one leaves the egg it is scarcely visible, and is seen immured among a number of insects infinitely larger than itself, ranged in proper order around it, which, however, give it no manner of apprehension.

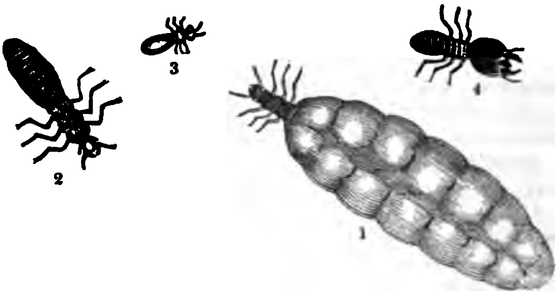
Whether the parent, when she laid in the insect provision, contrived to disable the worms from resistance, or whether they were at first incapable of any is not known. Certain it is, that the young glutton feasts upon the living spoil without any control; his game lies at his hand, and he devours one after the other as the calls of appetite incite him. The life of the young animal is therefore spent in the most luxurious manner, till its whole stock of worms is exhausted, and then the time of its transformation begins to approach; and then spinning a silken web, it continues fixed in its cell till the sun calls it from its dark abode the ensuing summer.

The wasps of Europe are very mischievous, yet they are innocence itself when compared to those of the tropical climates, where all the insect tribes are not only numerous, but large, voracious, and formidable. Those of the West Indies are thicker and twice as long as the common bee; they are of gray colour, striped with yellow, and armed with a very dangerous sting. They make their cells in the manner of a honey-comb, in which the young ones are hatched and bred. They generally hang their nests by threads, composed of the same substance with the cells, to the branches of trees, and the eaves of houses



Ichneumon, p. 191.

Gadfly, p. 84, vol. ii.



1. Queen Ant, pregnant. 2. Termes, or Ant of Africa, (King), p. 196
3. Labourer. 4. Soldier.

Moth, p. 165.

Common Fly, p. 165.

To face p. 191, vol. iv.

They are seen every where in great abundance, descending like fruit, particularly pears, of which shape they are, and as large as one's head. The inside is divided into three round stories, full of cells, each hexagonal like those of a honey comb. In some of the islands these insects are so very numerous, that their nests are stuck up in this manner, scarce two feet asunder, and the inhabitants are in continual apprehension from their accidental resentment. It sometimes happens, that no precautions can prevent their attacks, and the pains of their sting is almost insupportable. Those who have felt it think it more terrible than that of a scorpion; the whole visage swells, and the features are so disfigured, that a person is scarcely known by his most intimate acquaintance.

CHAPTER IV.

OF THE ICHNEUMON FLY

EVERY rank of insects, how voracious soever, have enemies that are terrible to them, and that revenge upon them the injuries done upon the rest of the Animated Creation. The wasp, as we have seen, is very troublesome to man, and very formidable to the insect tribe; but the ichneumon, fly (of which there are many varieties) fears not the wasp itself; it enters its retreats, plunders its habitations, and takes possession of that cell for its own young, which the wasp had laboriously built for a dearer posterity.

Though there are many different kinds of this insect, yet the most formidable, and that best known, is called the common ichneumon, with four wings, like the bee, a long, slender, black body, and a three-forked tail, consisting of bristles; the two outermost black, and the middlemost red. This fly receives its name from the little quadruped, which is found to be so destructive to the crocodile,as it bears a strong similitude in its courage and rapacity.

Though this instrument is, to all appearance, slender and feeble, yet it is found to be a weapon of great force and efficacy. There is scarce any substance which it will not pierce; and, indeed, it is seldom seen but employed in penetration. This is the weapon of defence; this is employed in destroying its prey; and still more, by this the animal deposits her eggs wherever she thinks fit to lay them. As it is an instrument chiefly employed for this purpose, the male is unprovided with such a sting, while the female uses it with great force and dexterity, brandishing it when caught, from side to side, and very often wounding those who thought they held her with the greatest security.

All the flies of this tribe are produced in the same manner, and owe their birth to the destruction of some other insect, within whose body they have been deposited, and upon whose vitals they have preyed, till they came to maturity. There is no insect whatever, that they will not attack in order to leave their fatal present in its body; the caterpillar, the gnat, and even the spider himself, so formidable to others, is often made the unwilling fosterer of this destructive progeny.

About the middle of summer, when other insects are found in great abundance, the ichneumon is seen flying busily about, and seeking proper objects upon whom to depose its progeny. As there are various kinds of this fly, so they seem to have various appetites. Some are found to place their eggs within the aurelia of some nascent insect, others place them within the nest, which the wasp had curiously contrived for its own young; and as both are produced at the same time, the young of the ichneumon not only devour the young wasp, but the whole supply of worms, which the parent had carefully provided for its provision. But the greatest number of the ichneumon tribe are seen settling upon the back of the caterpillar, and darting, at different intervals, their stings into its body. At every dart they deposit an egg, while the wounded animal seems scarcely sensible of the injury it sustains. In this manner they leave from six to a dozen of their eggs within the fatty substance of the reptile's body, and then fly off to commit further depredations. In the mean time, the caterpillar thus irreparably injured, seems to feed as voraciously as before; does not abate of its usual activity; and to all appearance, seems no way affected by the internal enemies that are preparing its destruction in their darksome abode. But they soon burst from their egg state, and begin to prey upon the substance of their prison. As they grow larger, they require a greater supply; till at last the animal, by whose vitals they are supported, is no longer able to sustain them, but dies; its whole inside being almost eaten away. It often happens, however, that it survives their worm state, and then they change into a chrysalis, inclosed in the caterpillar's body till the time of their delivery approaches, when they burst their prisons and fly away. The caterpillar, however, is irreparably destroyed, it never changes into a chrysalis, but dies shortly after from the injuries it had sustained.

Such is the history of this fly, which, though very terrible to the insect tribe, fails not to be of infinite service to mankind. The millions which it kills in a single summer, are inconceivable; and without such a destroyer, the fruits of the earth would only rise to furnish a banquet for the insect race, to the exclusion of all the nobler ranks of Animated Nature.

CHAPTER V.

OF THE ANT.

THOUGH the number of two-winged flies be very great, and the naturalists have taken some pains to describe their characters and varieties; yet there is such a similitude in their forms and manners, that in a work like this, one description must serve for all. We now, therefore, come to a species of four-winged insects, that are famous from all antiquity, for their social and industrious habits, that are marked for their spirit of subordination, that are offered as a pattern of parsimony to the profuse, and of unremitting diligence to the sluggard.

In the experiments, however, which have been more recently made and the observations which have been taken, much of their boasted fr bility and precaution seems denied them: the treasures they lay up are no longer supposed intended for future provision; and the choice they make in their stores, seems no way dictated by wisdom. It is, indeed, somewhat surprising, that almost every writer of antiquity should describe this insect, as labouring in the summer, and feasting upon the produce during the winter.—Perhaps, in some of the warmer climates, where the winter is mild, and of short continuance, this may take place; but in France and England, these animals can have no manner of occasion for a supply of winter provisions, as they are actually in a state of torpidity during that season.

The common ants of Europe are of two or three different kinds; some red, some black, some with stings, and others without; such as have stings inflict their wounds in that manner; such as are unprovided with these weapons of defence, have a power of spurting, from their hinder parts, an acid pungent liquor, which, if it lights upon the skin, inflames and burns it like nettles.

The body of an ant is divided into the head, breast, and belly. In the head the eyes are placed, which are entirely black, and under the eyes there are two small horns or feelers, composed of twelve joints, all covered with a fine silky hair. The mouth is furnished with two crooked jaws, which project outwards, in each of which are seen incisures, that look like teeth. The breast is covered with a fine silky hair, from which project six legs that are pretty strong and hairy, the extremities of each armed with two small claws which the animal uses in climbing. The belly is more reddish than the rest of the body, which is of a brown chesnut colour, shining as glass and covered with extremely fine hair.

From such a formation, this animal seems bolder, and more active, for its size, than any other of the insect tribe, and fears not to attack a creature, often above ten times its own magnitude.

As soon as the winter is past, in the first fine day in April, the ant-hill, that before seemed a desert, now swarms with new life, and myriads of these insects are seen just awaked from their annual lethargy, and preparing for the pleasures and fatigues of the season. For the first day they never offer to leave the hill, which may be considered as their citadel, but run over every part of it, as if to examine its present situation, to observe what injuries it has sustained during the rigours of winter,* while they slept, and to meditate and settle the labours of the day ensuing.

At the first display of their forces, none but the wingless tribe appears, while those furnished with wings remain at the bottom. These are the working ants, that first appear, and that are always destitute of wings; the males and females, that are furnished with four large wings each, are more slow in making their appearance.

Thus, like bees they are divided into males, females, and the neutral or the working tribe. These are all easily distinguishable from each other; the females are much larger than the males; the working ants are the smallest of all. The two former have wings; which, however, they sometimes are divested of; the latter never have any, and upon them are devolved all the labours that tend to the welfare of the community. The female, also, may be distinguished by the colour and structure of her breast, which is a little more brown than that of the common ant, and a little brighter than that of the male.

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* Memoirs pour servir a l'Historie des insectes par Charles de Geer.

In eight or ten days after their first appearance, the labours of the hill are in some forwardness; the males and females are seen mixed with the working multitude, and pursued or pursuing each other. They seem no way to partake in the common drudgeries of the state; the males pursue the females with great assiduity, and in a manner force them to compliance. They remain coupled for some time, while the males, thus united, suffer themselves to be drawn along by the will of their partners.

In the mean time, the working body of the state take no part in their pleasures; they are seen diligently going from the ant-hill, in pursuit of food for themselves and their associates, and of proper materials for giving a comfortable retreat to their young, or safety to their habitation. In the fields of England, ant-hills are formed with but little apparent regularity. In the more southern provinces of Europe, they are constructed with wonderful contrivance, and offer a sight highly worthy a naturalist's curiosity. These are generally formed in the neighbourhood of some large tree and a stream of water. The one is considered by the animals as the proper place for getting food; the other for supplying them with moisture, which they cannot well dispense with. The shape of the ant-hill, is that of a sugar loaf, about three feet high, composed of various substances; leaves, bits of wood, sand, earth, bits of gum, and grains of corn. These are all united into a compact body, perforated with galleries down to the bottom, and winding ways within the body of the structure. From this retreat, to the water, as well as to the tree, in different directions, there are many paths worn by constant assiduity, and along these the busy insects are seen passing and repassing continually; so that from May to the beginning of June according to the state of the season, they work continually, till the bad weather comes on.

The chief employment of the working ants, is in sustaining not only the idlers at home, but also finding a sufficiency of food for themselves. They live upon various provisions, as well of the vegetable as the animal kind. Small insects they will kill and devour; sweets, of all kinds, they are particularly fond of. They seldom, however, think of their community, till they themselves are first satiated. Having found a juicy fruit, they swallow what they can, and then tearing it in pieces, carry home their load. If they meet with an insect above their match, several of them will fall upon it at once, and having mangled it, each will carry off a part of the spoil. If they meet, in their excursions, any thing that is too heavy for one to bear, and yet, which they are unable to divide, several of them will endeavour to force it along; some dragging and others pushing.—If any one of them happens to make a lucky discovery, it will immediately give advice to others, and then, at once, the whole republic will put themselves in motion. If in these struggles, one of them happens to be killed, some kind survivor will carry him off to a great distance, to prevent the obstructions his body might give to the general spirit of industry.

But while they are thus employed in supporting the state, in feeding abroad, and carrying in provisions to those that continue at home, they are not unmindful of posterity. After a few days of fine weather, the emale ants, begin to lay their eggs, and those are as assiduously watched and protected by the working ants, who take upon themselves to supply whatever is wanting to the nascent animal's convenience or necessity They are carried, as soon as laid, to the safest situation, at the bottom of their hill, where they are carefully defended from cold and moisture. We are not to suppose, that those white substances which we so plentifully find in every ant-hill, are the eggs as newly laid. On the contrary, the ant's egg is so very small, that, though laid upon a black ground, it can scarcely be discerned.—The little white bodies we see, are the young animals in their maggot state, endued with life, long since freed from the egg, and often involved in a cone, which it has spun round itself, like the silk-worm. The real egg, when laid, if viewed through a microscope, appears smooth, polished, and shining, while the maggot is seen composed of twelve rings, and is often larger than the ant itself.

It is impossible to express the fond attachment which the working ants show to their rising progeny. In cold weather they take them in their mouths, but without offering them the smallest injury, to the very depths of their habitation, where they are less subject to the severity of the season.—In a fine day they remove them with the same care, nearer the surface, where their maturity may be assisted by the warm beams of the sun. If a formidable enemy should come to batter down their whole habitation, and crush them by thousands in the ruin, yet these wonderful insects still mindful of their parental duties, make it their first care to save their offspring. They are seen running wildly about, and different ways, each loaded with a young one, often bigger than the insect that supports it. I have kept, says Swammerdam, several of the working ants, in my closet, with their young, in a glass filled with earth. I took pleasure in observing that in proportion as the earth dried on the surface, they dug deeper and deeper to deposit their eggs; and when I poured water thereon, it was surprising to see with what care, affection and diligence they laboured, to put their brood in safety, in the driest place. I have seen also, that when water has been wanting for several days, and when the earth was moistened after it a little, they immediately carried their young ones to have a share, who seemed to enjoy and suck the moisture.

When the young maggot is come to its full growth, the breast swells insensibly, it casts its skin, and looses all motion. All the members which were hidden before, then begin to appear; an aurelia is formed, which represents very distinctly all the parts of the animal, though they are yet without motion, and, as it were, wrapped up in swaddling-clothes. When at length, the little insect has passed through all its changes, and acquired its proper maturity, it bursts this last skin, to assume the form it is to retain ever after. Yet this is not done by the efforts of the little animal alone, for the old ones very assiduously break open with their teeth the covering in which it is inclosed. Without this assistance the aurelia would never be able to get free, as M. De Geer often found, who tried the experiment by leaving the aurelia to themselves. The old ones not only assist them, but know the very precise time for lending their assistance: for, if produced too soon, the young one dies of cold; if retarded too long, it is suffocated in its prison.

When the female has done laying, and the whole brood is thus produced, her labours, as well as that of the male, become unnecessary, and her wings, which she had but a short time before so actively employed, drop off. What becomes of her when thus divested of her ornaments is not well known, for she is seen in the cells for some weeks after. The males, on the other hand, having no longer any occupation at home, make use of those wings with which they have been furnished by nature, and fly away, never to return, or to be heard of more. It is probable they perish with the cold or are devoured by the birds, which are particularly fond of this petty prey.

In the meantime, the working ants have probably deposed their queens, and being deserted by the males, that serve but to clog the community, prepare for the severity of the winter, and bury their retreats as deep in the earth as they conveniently can. It is now found that the grains of corn and other substances with which they furnish their hill, are only meant as fences to keep off the rigours of the weather, not as provisions to support them during its continuance. It is found generally to obtain, that every insect lives a year after it is come to its full growth, is obliged to pass four or five months without taking any nourishment, and will seem to be dead all that time. It would be to no purpose, therefore, for ants to lay up corn for winter, since they lie that time without motion, heaped upon each other, and are so far from eating, that they are utterly unable to stir. Thus what authors have dignified with the name of a magazine, appears to be no more than a cavity, which serves for a common retreat when the weather forces them to return to their lethargic state.

What has been said with exaggeration of the European ant, is however true, if asserted of those of the tropical climates. They build an ant-hill with great contrivance and regularity, they lay up provisions, and, as they probably live the whole year, they submit themselves to regulations entirely unknown among the ants of Europe.

Those of Africa are of three kinds, the red, the green, and the black; the latter are above an inch long, and in every respect a most formidable insect. Their sting produces extreme pain, and their depredations are sometimes extremely destructive. They build an ant-hill of a very great size, from six to twelve feet high; it is made of viscous clay, and tapers into a pyramidal form. This habitation is constructed with great artifice; and the cells are so numerous and even, that a honey-comb scarce exceeds them in number and regularity.

The inhabitants of this edifice seem to be under a very strict regulation. At the slightest warning they will sally out upon whatever disturbs them, and if they have time to arrest their enemy, he is sure to find no mercy. Sheep, hens, and even rats are often destroyed by these merciless insects, and their flesh devoured to the bone. No anatomist in the world can strip a skeleton so cleanly as they; and no animal, how strong soever, when they have once seized upon it, has power to resist them.

It often happens that these insects quit their retreat in a body, and go in quest of adventures. "During my stay," says Smith, "at Cape Corse Castle, a body of these ants came to pay us a visit in our fortification.

Great Stag Beetle, p. 197.

Hercules Beetle, p. 197.

Male and Female Glow-worm, p. 201.

Earwig, p. 187.

To face p. 197, vol. iv.

it was about day-break when the advanced guard of this famished crew entered the chapel, where some Negro servants were asleep upon the floor. The men were quickly alarmed at the invasion of this unexpected army, and prepared, as well as they could, for a defence. While the foremost battalion of insects had already taken possession of the place, the rear guard was more than a quarter of a mile distant. The whole ground seemed alive, and crawling with unceasing destruction. After deliberating a few moments upon what was to be done, it was resolved to lay a large train of gunpowder along the path they had taken; by this means millions were blown to pieces, and the rear guard perceiving the destruction of their leaders thought proper instantly to return, and make back to their original habitation."

The order which these ants observe, seems very extraordinary; whenever they sally forth, fifty or sixty larger than the rest, are seen to head the band, and conduct them to their destined prey. If they have a fixed spot where their prey continues to resort, they then form a vaulted gallery which is sometimes a quarter of a mile in length; and yet, they will hollow it out in the space of ten or twelve hours.

CHAPTER VI.

OF THE BEETLE AND ITS VARIETIES.

HITHERTO we have been treating of insects with four transparent wings, we now come to a tribe with two transparent wings, with cases that cover them close while at rest, but which allow them their proper play when flying. The principal of these are the Beetle, the May Bug, and the Cantharis. These are all bred like the rest of their order, first from eggs, they then become grubs, then a chrysalis, in which the parts of the future fly are distinctly seen, and lastly, the animal leaves its prison, breaking forth as a winged animal in full maturity.

Of the Beetle there are various kinds; all, however, concurring in one common formation of having cases to their wings, which are the more necessary to those insects, as they often live under the surface of the earth, in holes which they dig out by their own industry. These cases prevent the various injuries their real wings might sustain, by rubbing or crushing against the sides of their abode. These, though they do not assist flight, yet keep the internal wings clean and even, and produce a loud buzzing noise when the animal rises in the air.

If we examine the formation of all animals of the beetle kind, we shall find as in shell-fish, that their bones are placed externally, and their muscles within. These muscles are formed very much like those of quadrupeds, and are endued with such surprising strength, that, bulk for bulk, they are a thousand times stronger than those of a man.—The strength of these muscles is of use in digging the animal's subterraneous abode, where it is most usually hatched, and to which it most frequently returns, even after it becomes a winged insect, capable of flying.

Besides the difference which results from the shape and colour of these animals, the size also makes a considerable one; some beetles being not larger than the head of a pin, while others, such as the elephant beetle, are as big as one's fist: But the greatest difference among them is, that some are produced in a month, and in a single season go through all the stages of their existence; while others take near four years to their production, and live as winged insects a year more. To give the history of all these animals, that are bred pretty much in the same way, would be insipid and endless; it will suffice to select one or two from the number, the origin of which may serve as specimens of the rest. I will, therefore, offer the history of the May-bug to the reader's attention; premising that most other beetles, though not so long-lived, are bred in the same manner.

The May-bug, or dor-beetle, as some call it, has, like all the rest, a pair of cases to its wings, which are of a reddish brown colour, sprinkled with a whitish dust, which easily comes off. In some years their necks are seen covered with a red plate, and in others, with a black; these, however, are distinct sorts, and their difference is by no means accidental. The fore-legs are very short, and the better calculated for burrowing in the ground, where this insect makes its retreat. It is well known, for its evening buzz, to children; but still more formidably introduced to the acquaintance of husbandmen and gardeners; for, in some seasons, it has been found to swarm in such numbers, as to eat up every vegetable production.

The two sexes in the May-bug, are easily distinguished from each other, by the superior length of the tufts, at the end of the horns, in the male. They begin to copulate in summer, and, at that season, they are seen joined together for a considerable time. The female being impregnated, quickly falls to boring a hole in the ground, where to deposit her burden. This is generally about half a foot deep, and in it she places her eggs, which are of an oblong shape, with great regularity, one by the other. They are of a bright yellow colour, and no way wrapped up in a common covering, as some have imagined. When the female is lightened of her burden, she again ascends from her hole, to live as before upon leaves and vegetables, to buzz in the summer evening, and to lie hid among the branches of trees, in the heat of the day.

In about three months after these eggs have been thus deposited in the earth, the contained insect begins to break its shell, and a small grub or maggot crawls forth, and feeds upon the roots of whatever vegetable it happens to be nearest.

All substances of this kind seem equally grateful, yet it is probable the mother insect has a choice among what kind of vegetables she shall deposit her young. In this manner these voracious creatures continue in the worm state, for more than three years, devouring the roots of every plant they approach, and making their way under ground, in quest of food, with great despatch and facility. At length they grow to above the size of a walnut, being a great thick white maggot with a red head, which is seen most frequently in new-turned earth, and which is so eagerly sought after by birds of every species. When largest, they are found an inch and a half long, of a whitish yellow colour, with a body consisting of twelve segments or joints, on each side of which there are nine breathing holes, and three red feet. The head is large in proportion to the body, of a reddish colour, with a pincer before, and a semi-circular lip with which it cuts the roots of plants, and sucks out their moisture. As this insect lives entirely under ground, it has no occasion for eyes, and accordingly it is found to have none: but it is furnished with two feelers which, like the crutch of a blind man, serve to direct its motions. Such is the form of this animal, that lives for years in the worm state underground, still voracious, and every year changing its skin.

It is not till the end of the fourth year, that this extraordinary insect prepares to emerge from its subterraneous abode, and even this is not effected, but by a tedious preparation. About the latter end of autumn, the grub begins to perceive the approach of its transformation; it then buries itself deeper and deeper in the earth, sometimes six feet beneath the surface, and there forms itself a capacious apartment, the walls of which it renders very smooth and shining, by the exertions of its body. Its abode being thus formed, it begins, soon after, to shorten itself, to swell, and to burst its last skin, in order to assume the form of a chrysalis.—This, in the beginning, appears of a yellowish colour, which heightens by degrees, till at last it is seen nearly red. Its exterior form plainly discovers all the vestiges of the future winged insect, all the fore-parts being distinctly seen; while behind, the animal seems as if wrapped in swaddling clothes.

The young May-bug continues in this state for about three months longer; and it is not till the beginning of January, that the aurelia divests itself of all its impediments, and becomes a winged insect, completely formed. Yet still the animal is far from attaining its natural strength, health, and appetite. It undergoes a kind of infant imbecility, and unlike most other insects, that the instant they become flies, are arrived at their state of full perfection, the May-bug continues feeble and sickly. Its colour is much brighter than in the perfect animal, all its parts are soft, and its voracious nature seems, for a while, to have entirely forsaken it. As the animal is very often found in this state, it is supposed, by those unacquainted with its real history, that the old ones of the former season, have buried themselves for the winter, in order to revisit the sun the ensuing summer. But the fact is, the old one never survives the season, but dies, like all the other winged tribe of insects, from the severity of cold in winter.

About the latter end of May, these insects, after having lived for four years under ground, burst from the earth, when the first mild evening invites them abroad. They are at that time seen rising from their long imprisonment; from living only upon roots, and imbibing only the moisture of the earth, to visit the mildness of the summer air, to choose the sweetest vegetables for their banquet, and to drink the dew of the evening. Whenever an attentive observer then walks abroad, he will see them bursting up before him in his pathway, like ghosts on a theatre. He will see every part of the earth, that had its surface beaten into hardness, perforated by their egression. When the season is favourable for them, they are seen by myriads buzzing along, hitting against every object that intercepts their flight. The mid-day sun, however, seems too powerful for their constitutions; they then lurk under the leaves and branches of some shady tree; but the willow seems particularly their most favourite food; there they lurk in clusters, and seldom quit the tree till they have devoured all its verdure. In those seasons, which are favourable to their propa gation, they are seen in an evening as thick as flakes of snow, and hitting against every object with a sort of capricious blindness. Their duration, however, is but short, as they never survive the season. They begin to join shortly after they have been let loose from their prison, and when the female is impregnated, she cautiously bores a hole in the ground, with an instrument fitted for that purpose, which she is furnished with at the tail, and there deposits her eggs, generally to the number of threescore. If the season and the soil be adapted to their propagation, these soon multiply as already described, and go through the noxious stages of their contemptible existence. This insect, however, in its worm state, though prejudicial to man, makes one of the chief repasts of the feathered tribe, and is generally the first nourishment with which they supply their young. Rooks and hogs are particularly fond of these worms, and devour them in great numbers. The inhabitants of the county of Norfolk, some time since, went into the practice of destroying their rookeries, but in proportion as they destroyed one plague, they were pestered with a greater; and these insects multiplied in such an amazing abundance, as to destroy not only the verdure of the fields but even the roots of vegetables not yet shot forth. One farm in particular was so injured by them in the year 1751, that the occupier was not able to pay his rent, and the landlord was not only content to lose his income for that year, but also gave money for the support of the farmer and his family. In Ireland they suffered so much by these insects, that they came to a resolution of setting fire to a wood, of some miles in extent, to prevent their mischievous propagation.

Of all the beetle kind this is the most numerous, and therefore deserves the chief attention of history. The numerous varieties of other kinds might repay the curiosity of the diligent observer, but we must be content in general to observe, that in the great outlines of their history, they resemble those of which we have just been giving a description, like them, all other beetles are bred from the egg, which is deposited in the ground, or sometimes, though seldom, in the barks of trees; they change into a worm; they subsist in that state by living upon the roots of vegetables, or the succulent parts of the bark round them. They generally live a year at least before they change into an aurelia; in that state they are not entirely motionless, nor entirely swaddled up without form.

It would be tedious and endless to give a description of all, and yet it would be an unpardonable omission not to mention the particularities of some beetles, which are singular rather from their size, their manners, or their formation. That beetle, which the Americans call the Tumbledung, particularly demands our attention; it is all over of a dusky black, rounder than those animals are generally found to be, and so strong, though not much larger than the common black beetle, that if one of them be put under a brass candlestick, it will cause it to move backwards and forwards, as if it were by an invisible hand, to the admiration of those who are not accustomed to the sight; but this strength is given it for much more useful purposes than those of exciting human curiosity, for there is no creature more laborious, either in seeking subsistence, or in providing a proper retreat for its young. They are endowed with sagacity to discover subsistence, by their excellent smelling, which directs them in flights to excrements just fallen from man or beast, on which they instantly drop, and fall unanimously to work in forming round balls or pellets thereof, in the middle of which they lay an egg. These pellets, in September, they convey three feet deep in the earth, where they lie till the approach of spring; when the eggs are hatched the nests burst, and the insects find their way out of the earth. They assist each other with indefatigable industry, in rolling these globular pellets to the place where they are to be buried. This they are to perform with the tail foremost, by raising up their hinder part, and shoving along the ball with their hind-feet. They are always accompanied with other beetles of a larger size, and of a more elegant structure and colour. The breast of this is covered with a shield of crimson colour, and shining like metal; the head is of the like colour, mixed with green, and on the crown of the head stands a shining black horn, bended backwards. These are called the kings of the beetles, but for what reason is uncertain, since they partake of the same dirty drudgery with the rest.

The Elephant-beetle is the largest of this kind hitherto known, and is found in South-America, particularly Guiana and Surinam, as well as about the river Oroonoko. It is of a black colour, and the whole body is covered with a very hard shell, full as thick and as strong as that of a small crab. Its length, from the hinder part to the eyes, is almost four inches, and from the same part to the end of the proboscis, or trunk, four inches and three quarters. The transverse diameter of the body is two inches and a quarter, and the breadth of each elytron, or case for the wings, is an inch and three-tenths. The antennæ, or feelers, are quite horny; for which reason the proboscis, or trunk, is moveable at its insertion into the head, and seems to supply the place of feelers. The horns are eight-tenths of an inch long, and terminate in points. The proboscis is an inch and a quarter long, and turns upwards, making a crooked line, terminating in two horns, each of which is near a quarter of an inch long, but they are not perforated at the end like the proboscis of other insects. Above four-tenths of an inch above the head, or that side next the body, is a prominence or small horn, which if the rest of the trunk were away, would cause this part to resemble the horn of a rhinoceros. There is indeed a beetle, so called, but then the horns or trunk has no fork at the end, though the lower horn resembles this. The feet are all forked at the end, but not like lobsters' claws.

To this class we may also refer the Glow-worm, that little animal which makes such a distinguished figure in the descriptions of our poets. No two insects can differ more than the male and female of this species from each other. The male is in every respect a beetle, having cases to its wings, and rising in the air at pleasure; the female, on the contrary, has none, but is entirely a creeping insect, and is obliged to await the approaches of her capricious companion. The body of the female has eleven joints, with a shield breast-plate, the shape of which is oval; the head is placed over this, and is very small, and the three last joints of her body are of a yellowish colour; but what distinguishes it from all other animals, at least in this part of the world, is the shining light which it emits by night, and which is supposed by some philosophers to be an emanation which she sends forth to allure the male to her company.—Most travellers who have gone through sandy countries, must well remem ber the little, shining sparks with which the ditches are studded on each side of the road. If incited by curiosity to approach more nearly, he will find this light sent forth by the glow-worm ; if he should keep the little animal for some time, its light continues to grow paler, and at last appears totally extinct. The manner in which the light is produced has hitherto continued inexplicable ; it is probable the little animal is supplied with some electrical powers, so that by rubbing the joints of its body against each other, it thus supplies a stream of light, which if it allures the male, as we are told, serves for very useful purposes.

The Cantharis is of the beetle kind, from whence come cantharides, well known in the shops by the name of Spanish flies, and for their use in blisters. They have feelers like bristles, flexible cases to the wings, a breast pretty plain, and the sides of the belly wrinkled. Cantharides differ from each other in their size, shape, and colour ; those used in the shops also do the same. The largest in these parts are about an inch long, and as much in circumference, but others are not above three quarters of an inch. Some are of a pure azure colour, others of pure gold, and others again, have a mixture of pure gold and azure colours ; but they are all very brilliant, and extremely beautiful. These insects, as is well known, are of the greatest benefit to mankind, making a part in many medicines conducive to human preservation. They are chiefly natives of Spain, Italy, and Portugal ; but they are to be met with also about Paris in the summer time, upon the leaves of the ash, the poplar, and the rose-trees, and also among wheat, and in meadows. It is very certain, that these insects are fond of ash-leaves, insomuch that they will sometimes strip one of these trees quite bare. Some affirm that these flies delight in sweet smelling-herbs ; and it is very certain, that they are fond of honey-suckles, lilac, and wild-cherry shrubs ; but some that have sought after them declare, they never could find them on elder-trees, nut-trees, and among wheat. We are told that the country people expect the return of these insects every seven years. It is certain, that such a number of these insects have been seen together in the air, that they appeared like swarms of bees ; and that they have so disagreeable a smell, that it may be perceived a great way off, especially about sun-set, though they are not seen at that time. This bad smell is a guide for those who make it their business to catch them. When they are caught they dry them, after which they are so light, that fifty will hardly weigh a dram. Those that gather them, tie them in a bag, or a piece of linen cloth. that has been well worn, and then they kill them with the vapours of hot vinegar, after which they dry them in the sun, and keep them in boxes. These flies, thus dried, being chemically analysed, yield a great deal of volatile, caustic salt, mixed with a little oil, phlegm, and earth. Cantharides are penetrating, corrosive, and, applied to the skin, raise blisters, from whence proceeds a great deal of serosity. They are made use of both inwardly and outwardly. However, it is somewhat strange that the effects of these flies should fall principally upon the urinary passages, for though some authors have endeavoured to account for this, we are still in the dark, for all they have said amounts to no more, than that they affect these parts in a manner which may be very learnedly described, but very obscurely comprehended

An insect of great, though perhaps not equal use in medicine, is that which is known by the name of the Kermes; it is produced in the excrescence of an oak, called the berry-bearing ilex, and appears at first wrapt up in a membranaceous bladder, of the size of a pea, smooth and shining, of a brownish red colour, and covered with very fine ash-coloured powder. This bag teems with a number of reddish eggs or insects, which being rubbed with the fingers pour out a crimson liquor. It is only met with in warm countries in the months of May and June. In the month of April this insect becomes of the size and shape of a pea, and its eggs some time after burst from the womb, and soon turning worms, run about the branches and leaves of the tree. They are of two sexes, and the females have been hitherto described; but the males are very distinct from the former, and are a sort of small flies like gnats, with six feet, of which the four forward are short, and the two backward long, divided into four joints, and armed with three crooked nails. There are two feelers on the head, a line and a half long, which are moveable, streaked, and articulated. The tail, at the back part of the body, is half a line long and forked. The whole body is covered with two transparent wings, and they leap about in the manner of fleas. The harvest of the Kermes is greater or less in proportion to the severity of the winter, and the women gather them before sun-rising, tearing them off with their nails: for fear there should be any loss from the hatching of the insects. They sprinkle them with vinegar, and lay them in the sun to dry, where they acquire a red colour.

An insect, perhaps, still more useful than either of the former, is the Cochineal, which has been very variously described by authors; some have supposed it a vegetable excrescence from the tree upon which it is found; some have described it as a louse, some as a bug, and some as a beetle. As they appear in our shops when brought from America, they are of an irregular shape, convex on one side, and a little concave on the other; but are both marked with transverse streaks or wrinkles. They are of a scarlet colour within, and without of a blackish red, and sometimes of a white, reddish, or ash-colour, which are accounted the best, and are brought to us from Mexico. The cochineal insect is of an oval form, of the size of a small pea, with six feet, and a snout or trunk. It brings forth its young alive, and is nourished by sucking the juice of the plant. Its body consists of several rings, and when it is once fixed on the plant, it continues immoveable, being subject to no change. Some pretend there are two sorts, the one domestic, which is best, and the other wild, that is of a vivid colour; however, they appear to be the same, only with this difference, that the wild feeds upon uncultivated trees, without any assistance, whereas the domestic is carefully, at a stated season, removed to cultivated trees, where it feeds upon a purer juice. Those who take care of these insects place them upon the prickly pear-plant in a certain order, and are very industrious in defending them from other insects; for if any other kind come among them, they take care to brush them off with foxes' tails. Towards the end of the year, when the rains and cold weather are coming on, which are fatal to these insects, they take off the leaves or branches covered with cochineal, that have not attained their utmost degree of perfection, and keep them in their houses till winter is past. These leaves are very thick and juicy, and supply them with sufficient nourishment, while they remain within doors. When the milder weather returns, and these animals are about to exclude their young, the natives make them nests, like those of birds, but less, of tree moss, or soft hay, or the down of cocoa-nuts, placing twelve in every nest. These they fix on the thorns of the prickly pear-plant, and in three or four days' time they bring forth their young, which leave their nest in a few days, and creep upon the branches of the plant, till they find a proper place to rest in, and take in their nourishment; and until the females are fecundated by the males, which, as in the former tribe, differ very widely from the females, being winged insects, whereas the others only creep, and are at most stationary. When they are impregnated, they produce a new offspring; so that the propagator has a new harvest thrice a year. When the native Americans have gathered the cochineal, they put them into holes in the ground, where they kill them with boiling water, and afterwards dry them in the sun, or in an oven, or lay them upon hot plates. From the various methods of killing them, arise the different colours which they appear in when brought to us. While they are living, they seem to be sprinkled over with a white powder, which they lose as soon as the boiling water is poured upon them.—Those that are dried upon hot plates are the blackest. What we call the cochineal are only the females, for the males are a sort of fly, as already observed in the kermes. They are used both for dying and medicine, and are said to have much the same virtue as the kermes, though they are now seldom used alone, but are mixed with other things for the sake of the colour.

I shall end this account of the beetle tribe with the history of an animal which cannot properly be ranked under this species, and yet which cannot be more methodically ranged under any other. This is the insect that forms and resides in the gall-nut, the spoils of which are converted to such useful purposes. The gall-insects are bred in a sort of bodies adhering to a kind of oak in Asia, which differ with regard to their colour, size, roughness, smoothness, and shape, and which we call galls. They are not fruit, as some have imagined, but preternatural tumours, owing to the wounds given to the buds, leaves, and twigs of the tree, by a kind of insects that lay their eggs within them. This animal is furnished with an implement by which the female penetrates into the bark of the tree, or into that spot which just begins to bud, and there sheds a drop of corrosive fluid into the cavity. Having thus formed a receptacle for her eggs, she deposits them in the place, and dies soon after. The heart of the bud being thus wounded, the circulation of the nutritive juice is interrupted, and the fermentation thereof, with the poison injected by the fly, burns the parts adjacent, and then alters the natural colour of the plant. The juice or sap turned back from its natural course, extravasates and flows round the egg. After which it swells and dilates by the assistance of some bubbles of air, which get admission through the pores of the bark, and which run in the vessels with the sap. The external coat of this excrescence is dried by the air, and grows into a figure which bears some resemblance to the bow of an arch, or the roundness of a kernel. This little ball receives its nutriment, growth, and vegetation as the other parts of the tree, by slow degrees, and is what we call the *gall-nut*. The worm that is hatched under this spacious vault, finds in the substance of the ball, which is as yet very tender, a subsistence suitable to its nature; gnaws and digests it till the time comes for its transformation to a nymph, and from that state of existence changes into a fly. After this, the insect perceiving itself duly provided with all things requisite, disengages itself soon from its confinement, and takes its flight into the open air. The case, however, is not similar with respect to the gall-nut that grows in autumn. The cold weather frequently comes on before the worm is transformed into a fly, or before the fly can pierce through its inclosure. The nut falls with the leaves, and although you may imagine that the fly which lies within is lost, yet in reality it is not so; on the contrary, its being covered up so close, is the means of its preservation. Thus it spends the winter in a warm house, where every crack and cranny of the nut is well stopped up; and lies buried as it were, under a heap of leaves, which preserves it from the injuries of the weather. This apartment, however, though so commodious a retreat in the winter, is a perfect prison in the spring. The fly, roused out of its lethargy by the first heats, breaks its way through, and ranges where it pleases. A very small aperture is sufficient, since at this time the fly is but a diminutive creature. Besides, the ringlets whereof its body is composed, dilate, and become pliant in the passage.

CHAPTER VII.

OF THE GNAT AND TIPULA.

THERE are two insects which entirely resemble each other in their form, and yet widely differ in their habits, manners, and propagation. Those who have seen the tipula, or long-legs, and the larger kind of gnat, have most probably mistaken the one for the other; they have often accused the tipula, a harmless insect, of depredations made by the gnat, and the innocent have suffered for the guilty; indeed the differences in their form are so very minute, that it often requires the assistance of a microscope to distinguish the one from the other: they are both mounted on long legs, both furnished with two wings and a slender body; their heads are large and they seem to be hump-backed; the chief and only difference, therefore, is, that the tipula wants a trunk, while the gnat has a large one, which it often exerts to very mischievous purposes. The tipula is a harmless, peaceful insect, that offers injury to nothing; the gnat is sanguinary and predaceous, ever seeking out for a place in which to bury its trunk, and pumping up the blood from the animal in large quantities.

The gnat proceeds from a little worm which is usually seen at the bottom of standing waters. The manner in which the insect lays its eggs is particularly curious; after having laid the proper number on the surface of the water, it surrounds them with a kind of unctuous matter, which prevents them from sinking, but at the same time fastens them with a thread to the bottom, to prevent their floating away, at the mercy of every breeze, from a place, the warmth of which is proper for their production, to any other, where the water may be too cold, or the animals, its enemies, too numerous. Thus the insects, in their egg state, resemble a buoy which is fixed by an anchor. As they come to maturity they sink deeper; and at last, when they leave the egg as worms, they creep at the bottom. They now make themselves lodgments of cement, which they fasten to some solid body at the very bottom of the water, unless, by accident, they meet with a piece of chalk, which, being of a soft and pliant nature, gives them an opportunity of sinking a retreat for themselves, where nothing but the claws of cray-fish can possibly molest them. The worm afterwards changes its form. It appears with a large head, and a tail invested with hair, and moistened with an oleaginous liquor, which she makes use of as a cork, to sustain her head in the air, and her tail in the water, and to transport her from one place to another. When the oil with which her tail is moistened begins to grow dry, she discharges out of her mouth an unctuous humour, which she sheds all over her tail, by virtue whereof she is enabled to transport herself where she pleases, without being either wet or any ways incommoded by the water. The gnat, in her second state, is properly speaking in her form of a nymph, which is an introduction, or entrance into new life. In the first place, she divests herself of her second skin; in the next she resigns her eyes, her antennæ, and her tail; in short, she actually seems to expire. However, from the spoils of the amphibious animal, a little winged insect, cuts the air, whose every part is active to the last degree, and whose whole structure is the just object of our admiration. Its little head is adorned with a plume of feathers, and its whole body invested with scales and hair, to secure it from any wet or dust. She makes trial of the activity of her wings, by rubbing them either against her body, or her broad side-bags which keep her in an equilibrium. The furbelow, or little border of fine feathers which graces her wings, is very curious, and strikes the eye in the most agreeable manner. There is nothing, however, of greater importance to the gnat, than her trunk, and that weak-implement may justly be deemed one of Nature's master-peices. It is so very small, that the extremity of it can scarcely be discerned through the best microscope that can be procured. That part which is at first obvious to the eye, is nothing but a long scaly sheath under the throat. At near the distance of two-thirds of it, there is an aperture, through which the insect darts out four stings, and afterwards retracts them. One of which, however sharp and active it may be, is no more than the case in which the other three lie concealed, and run in a long grove. The sides of these stings are sharpened like two-edged swords; they are likewise barbed, and have a vast number of cutting teeth towards the point, which turns up like a hook, and is fine beyond expression. When all these darts are stuck into the flesh of animals sometimes one after another, and sometimes all at once, the blood and humours of the adjacent parts must unavoidably be extravasated; upon which a tumour must consequently ensue, the little orifice whereof is closed up by the compression of the external air. When the gnat, by the point of her case, which she makes use of as a tongue, has tasted any fruit, flesh, or juice that she has found out; if it be a fluid, she sucks it up without playing her darts into it; but in case she finds the least obstruction by any flesh whatever, she exerts her strength, and pierces through it, if possibly she can. After this she draws back her stings into their sheath, which she applies to the wound in order to extract, as through a reed, the juices which she finds inclosed. This is the implement with which the gnat performs her work in the summer, for during the winter she has no manner of occasion for it. Then she ceases to eat, and spends all that tedious season either in quarries or in caverns, which she abandons at the return of summer, and flies about in search after some commodious ford, or standing water, where she may produce her progeny, which would be soon washed away and lost, by the too rapid motion of any running stream. The little brood are sometimes so numerous, that the very water is tinged according to the colour of the species, as green, if they be green, and of a sanguine hue, if they be red.

These are circumstances sufficiently extraordinary in the life of this little animal, but it offers something still more curious in the method of its propagation. However similar insects of the gnat kind are in their appearance, yet they differ widely from each other in the manner in which they are brought forth, for some are oviparous, and are produced from eggs; some are viviparous, and come forth in their most perfect form; some are males, and unite with the females; some are females, requiring the impregnation of the male; some are of neither sex, yet still produce young, without any copulation whatsoever.—This is one of the strangest discoveries in all Natural History! A gnat separated from the rest of its kind, and inclosed in a glass vessel, with air sufficient to keep it alive, shall produce young, which also, when separated from each other, shall be the parents of a numerous progeny. Thus, down for five or six generations do these extraordinary animals propagate without the use of copulation, without any congress betwen the male and the female, but in the manner of vegetables, the young bursting from the body of their parents, without any previous impregnation. At the sixth generation however, their propagation stops; the gnat no longer produces its like, from itself alone, but it requires the access of the male to give it another succession of fecundity.

The gnat of Europe gives but little uneasiness; it is sometimes heard to hum about our beds at night, and keeps off the approach of sleep by the apprehension it causes; but it is very different in the ill-peopled regions of America, where the waters stagnate, and the climate is warm, and where they are produced in multitudes beyond expression. The whole air is there filled with clouds of those famished insects, and they are found of all sizes from six inches long, to a minuteness that even requires the microsrope to have a distinct perception of them. The warmth of the mid-day sun is too powerful for their constitutions; but when the evening approaches neither art nor flight can shield the wretched inhabitants from their attacks; though millions are destroyed, still millions more succeed and produce unceasing torment. The native Indians, who anoint their bodies with oil, and who have from their infancy been used to their depredations, find them much less inconvenient than those who are newly arrived from Europe; they sleep in their cottages covered all over with thousands of the gnat kind upon their bodies, and yet do not seem to have their slumbers interrupted by their cruel devourers. If a candle happens to be lighted in one of those places, a cloud of insects at once light upon the flame, and extinguish it; they are therefore obliged to keep their candles in glass lanterns; a miserable expedient to prevent an unceasing calamity

BOOK V.

OF THE ZOOPHYTES.

CHAPTER I.

OF ZOOPHYTES IN GENERAL.

WE now come to the last link in the chain of Animated Nature, to a class of beings so confined in their powers, and so defective in their formation, that some historians have been at a loss whether to consider them as a superior rank of vegetables, or the humblest order of the animated tribe. In order, therefore, to give them a denomination agreeable to their existence, they have been called Zoophytes, a name implying vegetable nature endued with animal life; and, indeed, in some the marks of the animal are so few, that it is difficult to give their place in Nature with precision, or to tell whether it is a plant or an insect that is the object of our consideration.

Should it be asked what is it that constitutes the difference between, animal and vegetable life; what is it that lays the line that separates those two great kingdoms from each other, it would be difficult, perhaps we should find it impossible, to return an answer. The power of motion cannot form this distinction, since some vegetables are possessed of motion, and many animals are totally without it.—The sensitive plant has obviously a greater variety of motions than the oyster or the pholas. The animal that fills the acorn-shell is immoveable, and can only close its lid to defend itself from external injury, while the flower, which goes by the name of the fly-trap, seems to close upon the flies that light upon it, and that attempt to rifle it of its honey. The animal in this instance, seems to have scarce a power of self-defence; the vegetable not only guards its possessions, but seizes upon the robber that would attempt to invade them. In like manner, the methods of propagation give no superiority to the lower rank of animals. On the contrary, vegetables are frequently produced more conformably to the higher ranks of the creation, and though some plants are produced by cuttings from others, yet the general manner of propagation is from seeds, laid in the womb of the earth, where they are hatched into the similitude of the parent plant or flower. But a most numerous tribe of animals have lately been discovered, which are propagated by cuttings, and this in so extraordinary a manner, that, though the original insect be divided into a thousand parts, each, however small, shall be formed into an animal, entirely resembling that which was at first divided; in this respect, therefore, certain races of animals seem to fall beneath vegetables, by their more imperfect propagation.

What, therefore, is the distinction between them—or are the orders so intimately blended as that it is impossible to mark the boundaries of each? To me it would seem, that all animals are possessed of one power, of which vegetables are totally deficient; I mean either the actual ability, or an awkward attempt at self-preservation. However vegetables may seem possessed of this important quality, yet it is with them but a mechanical impulse, resembling the raising one end of the lever, when you depress the other; the sensitive plant contracts and hangs its leaves indeed, when touched, but this motion no way contributes to its safety; the fly-trap flower acts entirely in the same manner; and though it seems to seize the little animal, that comes to annoy it, yet, in reality, it only closes mechanically upon it, and this inclosure neither contributes to its preservation nor its defence. But it is very different with insects, even of the lowest order; the earth-worm not only contracts, but hides itself in the earth, and escapes with some share of swiftness from its pursuers. The polypus hides its horns; the star-fish contracts its arms, upon the appearance even of distant dangers; they not only hunt for their food, but provide for their safety; and however imperfectly they may be formed, yet still they are in reality placed many degrees above the highest vegetable of the earth, and are possessed of many animal functions, as well as those that are more elaborately formed.

But though these be superior to plants, they are very far beneath their animated fellows of existence. In the dress of zoophytes, we may place all those animals which may be propagated by cuttings, or in other words, which, if divided into two or more parts, each part in time becomes a separate and perfect animal; the head shoots forth a tail, and, on the contrary, the tail produces a head; some of these will bear dividing but into two parts, such is the earth-worm; some may be divided into more than two, and of this kind are many of the star fish; others still may be cut into a thousand parts, each becoming a perfect animal; they may be turned inside out, like the finger of a glove; they may be moulded into all manner of shapes, yet still their vivacious principle remains, still every single part becomes perfect in its kind, and after a few days'existence, exhibits all the arts and industry of its contemptible parent! We shall, therefore, divide zoophytes according to their several degrees of perfection, namely, into worms, star-fish, and polypi; contenting ourselves with a short review of those nauseous and despicable creatures, that excite our curiosity chiefly by their imperfections; it must not be concealed, however, that much has of late been written on this part of natural history. A new mode of animal production, could not fail of exciting not only the curiosity but the astonishment of every philosopher; many found their favourite systems totally overthrown by the discovery, and it was not without a wordy struggle that they gave up what had formerly been their pleasure and their pride. At last, however, conviction became too strong for argument, and a question, which owed its general spread rather to its novely, than to its importance, was given up in favour of the new discovery.

CHAPTER II.

OF WORMS.

The first in the class of zoophytes, are animals of the worm kind, which being entirely destitute of feet, trail themselves along upon the ground, and find themselves a retreat under the earth, or in the water. As these, like serpents, have a creeping motion, so both, in general, go under the common appellation of reptiles; a loathsome, noxious, malignant tribe, to which man by nature, as well as by religion, has the strongest antipathy. But though worms, as well as serpents, are mostly without feet, and have been doomed to creep along the earth on their bellies, yet their motions are very different. The serpent, as has been said before, having a back bone which it is incapable of contracting, bends its body into the form of a bow, and then shoots forward, from the tail; but it is very different with the worm, which has a power of contracting or lengthening itself at will. There is a spiral muscle, that runs round its whole body, from the head to the tail, somewhat resembling a wire, wound round a walking-cane, which when slipped off, and one end extended and held fast will bring the other nearer to it; in this manner the earth-worm, having shot out, or extended its body, takes hold by the slime of the fore part of its body, and so contracts and brings forward the hinder parts; in this manner it moves onward, not without great effort; but the occasions for its progressive motion are few.

As it is designed for living under the earth, and leading a life of obscurity, so it seems tolerably adapted to its situation. Its body is armed with small stiff sharp burrs or prickles, which it can erect or depress at pleasure; under the skin there lies a slimy juice, to be ejected as occasion requires, at certain perforations, between the rings of the muscles, to lubricate its body, and facilitate its passage into the earth. Like most other insects, it hath breathing-holes along the back, adjoining each ring; but it is without bones, without eyes, without ears, and properly without feet. It has a mouth, and also an alimentary canal, which runs along to the very point of the tail. In some worms, however, particularly such as are found in the bodies of animals, this canal opens towards the middle of the belly, at some distance from the tail. The intestines of the earthworm are always found filled with a very fine earth, which seems to be the only nourishment these animals are capable of receiving.

The animal is entirely without brain, but near the head is placed the heart, which is seen to beat with a very distinct motion, and round it are the spermatic vessels, forming a number of little globules, containing a milky fluid, which have an opening into the belly, not far from the head: they are also often found to contain a number of eggs, which are laid in the earth, and are hatched in twelve or fourteen days into life, by the genial warmth of their situation; like snails, all these animals unite in themselves both sexes at once; the reptile that impregnates being impregnated in turn, few that walk out, but must have observed them, with their heads laid against each other, and so strongly attached, that they suffer themselves to be trodden upon.

When the eggs are laid in the earth, which, in about fourteen days, as has been said, are hatched into maturity, the young ones come forth very small, but perfectly formed, and suffer no change during their existence how long their life continues is not well known, but it certainly holds for more than two or three seasons. During the winter, they bury themselves deeper in the earth, and seem, in some measure, to share the general torpidity of the insect tribe. In spring, they revive with the rest of Nature, and on those occasions, a moist or dewy evening brings them forth from their retreats, for the universal purpose of continuing their kind. They chiefly live in a light, rich, and fertile soil, moistened by dews or accidental showers, but avoid those places where the water is apt to lie on the surface of the earth, or where the clay is too stiff for their easy progression under ground.

Helpless as they are formed, yet they seem very vigilant in avoiding those animals that chiefly make them their prey; in particular, the mole, who feeds entirely upon them beneath the surface, and who seldom ventures, from the dimness of its sight into the open air; him they avoid, by darting up from the earth, the instant they feel the ground move; and fishermen, who are well acquainted with this, take them in what numbers they choose, by stirring the earth where they expect to find them. They are also driven from their retreats under ground, by pouring bitter or acrid water thereon, such as that water in which green walnuts have been steeped, or a lye made of pot-ashes.

Such is the general outline of the history of these reptiles, which, as it should seem, degrades them no way beneath the rank of other animals of the insect creation; but we now come to a part of their history, which proves the imperfection of their organs, from the easiness with which these little machines may be damaged and repaired again. It is well known in mechanics, that the finest and most complicated instruments are the most easily put out of order, and the most difficultly set aright; the same also obtains in the animal machine. Man, the most complicated machine of all others, whose nerves are more numerous, and powers of action more various, is most easily destroyed: he is seen to die under wounds which a quadruped or a bird could easily survive; and as we descend gradually to the lower ranks, the ruder the composition, the more difficult it is to disarrange it. Some animals live without their limbs, and often are seen to reproduce them; some are seen to live without their brain for many weeks together; caterpillars continue to increase and grow large, though all the nobler organs are entirely destroyed within; some animals continue to exist, though cut in two, their noble parts preserving life, while the others perish that were cut away; but the earthworm, and all the zoophyte tribe continue to live in separate parts, and one animal, by the means of cutting, is divided into two distinct existences, sometimes into a thousand!

There is no phænomenon in all Natural History more astonishing than this, that man, at pleasure, should have a kind of creative power, and out of one life make two, each completely formed, with all its apparatus and functions; each with its perceptions, and powers of motion and self-preservation; each as complete in all respects as that from which it derived its existence, and equally enjoying the humble gratifications of its nature

When Des Cartes first started the opinion, that brutes were machines, the discovery of this surprising propagation was unknown, which might, in some measure have strengthened his fanciful theory. What is life, in brutes, he might have said, or where does it reside? In some we find it so diffused, that every part seems to maintain a vivacious principle, and the same animal appears possessed of a thousand distinct irrational souls at the same time. But let us not, he would say, give so noble a name to such contemptible powers, but rank the vivifying principle in these, with the sap that rises in vegetables, or the moisture that contracts a cord, or the heat that puts water into motion! Nothing, in fact, deserves the name of soul, but that which reasons, that which understands, and by knowing God, receives the mark of its currency, and is minted with the impression of its great Creator!

Such might have been the speculations of this philosopher: however, to leave theory, it will be sufficient to say that we owe the first discovery of this power of reproduction in animals to Mr. Trembley, who first observed it in the polypus, and after him, Spalanzani and others found it taking place in the earth-worm, the sea-worm, and several other ill-formed animals of a like kind, which were susceptible of this new mode of propagation. This last philosoper has tried several experiments upon the earth worm, many of which succeeded according to his expectation; every earth-worm, however, did not retain the vivacious principle with the same obstinacy; some, when cut in two, were entirely destroyed; others survived only in the nobler part; and while the head was living, the tail entirely perished, and a new one was seen to bourgeon from the extremity. But what was most surprising of all, in some, particularly in the small red-headed earth-worm, both extremities survived the operation; the head produced a tail with the anus, the intestines, the annular muscles, and the prickly beards; the tail part, on the other hand, was seen to shoot forth the nobler organs, and in less than the space of three months sent forth a head and heart, with all the apparatus and instruments of generation. This part, as may easily be supposed, was produced much more slowly than the former, a new head taking above three or four months for its completion, a new tail being shot forth in less than as many weeks. Thus two animals, by dissection, were made out of one, each with their separate appetites, each endued with life and motion, and seemingly as perfect as that single animal from whence they derived their origin.

What was performed upon the earth-worm, was found to obtain also in many other of the vermicular species. The sea-worm, the white water-worm, and many of those little worms with feelers, found at the bottom of dirty ditches; in all these the nobler organs are of such little use, that if taken away, the animal does not seem to feel the want of them; it lives in all its parts, and in every part, and by a strange paradox in Nature, the most useless and contemptible life is of all others the most difficult to destroy.

CHAPTER III.

OF THE STAR-FISH

THE next order of zoophytes is that of the star-fish, a numerous tribe shapeless and deformed, assuming at different times different appearances. The same animal that now appears round like a ball, shortly after flattens as thin as a plate. All of this kind are formed of a semi-transparent gelatinous substance, covered with a thin membrane, and, to an inattentive spectator, often appear like a lump of inanimate jelly, floating at random upon the surface of the sea, or thrown by chance on shore at the departure of the tide. But upon a more minute inspection, they will be found possessed of life and motion; they will be found to shoot forth their arms in every direction, in order to seize upon such insects as are near, and to devour them with great rapacity. Worms, the spawn of fish, and even muscles themselves, with their hard resisting shell, have been found in the stomachs of these voracious animals; and what is very extraordinary, though the substance of their own bodies be almost as soft as water, yet they are no way injured by swallowing these shells, which are almost of a stony hardness. They increase in size as all other animals do. In summer, when the water of the sea is warmed by the heat of the sun, they float upon the surface, and in the dark they send forth a kind of shining light resembling that of phosphorus. Some have given these animals the name of sea-nettles, because they burn the hands of those that touch them, as nettles are found to do. They are often seen fastened to the rocks, and to the largest sea-shells, as if to derive their nourishment from them. If they be taken and put into spirits of wine, they will continue for many years entire; but if they be left to the influence of the air, they are, in less than four and twenty hours, melted down into limpid and offensive water.

In all of this species, none are found to possess a vent for their excrements, but the same passage by which they devour their food, serves for the ejection of their fæces. These animals, as was said, take such a variety of figures, that it is impossible to describe them under one determinate shape; but in general their bodies resemble a truncated cone, whose base is applied to the rock to which they are found usually attached.—Though generally transparent, yet they are found of different colours, some inclining to green, some to red, some to white, and some to brown. In some, their colours appear diffused over the whole surface, in some they are often streaked and in others often spotted. They are possessed of a very slow progressive motion, and in fine weather they are continually seen, stretching out and fishing for their prey. Many of them are possessed of a number of long slender filaments, in which they entangle any small animals they happen to approach, and thus draw them into their enormous stomachs, which fill the whole cavity of their bodies. The harder shells continue for some weeks indigested, but at length, they undergo a kind of maceration in the stomach, and become a part of the substance of the animal itself. The indigestible parts are returned by the same aperture by which they were swallowed, and then the star-fish begins to fish for more. These also may be cut in pieces, and every part will survive the operation; each becoming a perfect animal, endued with its natural rapacity. Of this tribe, the number is various, and the description of each would be tedious and uninstructing; the manners and nature of all, are nearly as described; but I will just make mention of one creature, which, though not properly belonging to this class, yet is so nearly related, that the passing it in silence would be an unpardonable omission.

Of all other animals, the cuttle-fish, though in some respects superior to this tribe, possesses qualities the most extraordinary. It is about two feet long, covered with a very thin skin, and its flesh composed of a gelatinous substance, which, however, within-side, is strengthened by a strong bone, of which great use is made by the gold smiths. It is possessed of eight arms, which it extends, and which are probably of service to it in fishing for its prey; while in life, it is capable of lengthening or contracting these at pleasure; but when dead they contract and lose their rigidity. They feed upon small fish, which they seize with their arms; and they are bred from eggs, which are laid upon the weeds along the sea-shore.

The cuttle-fish is found along many of the coasts of Europe, but are not easily caught, from a contrivance, with which they are furnished by Nature; this is a black substance, of the colour of ink, which is contained in a bladder generally on the left side of the belly, and which is ejected in the manner of an excrement from the anus. Whenever, therefore, this fish is pursued, and when it finds a difficulty of escaping, it spurts forth a great quantity of this black liquor, by which the waters are totally darkened, and then it escapes, by lying close at the bottom. In this manner the creature finds its safety; and men find ample cause for admiration, from the great variety of stratagems with which creatures are endued for their peculiar preservation.

CHAPTER IV.

OF THE POLYPUS.

THOSE animals which we have described in the last chapter are variously denominated. They have been called the Star-fish, Sea-nettles, and Sea-polypi. This last name has been peculiarly ascribed to them by the ancients, because of the number of feelers or feet of which they are all possessed, and with which they have a slow, progressive motion; but the moderns have given the name of Polypus, to a reptile that lives in fresh-water, by no means so large or observable. These are found at the bottom of wet ditches, or attached to the under surface of the broad-leafed plants that grow and swim on the waters. The same difference holds between these and the sea-water polypus, as between all the productions of the sea, and of the land and the ocean. The marine vegetables and animals grow to a monstrous size. The eel, the pike, or the bream of fresh-waters, are but small; but in the sea they grow to an enormous magnitude. The herbs of the field are at most but a few feet high; those of the sea often shoot forth a stalk of a hundred. It is so between the polypi of both elements. Those of the sea are found from two feet in length to three or four, and Pliny has even described one, the arms of which were no less than thirty feet long. Those in fresh waters, however, are comparatively minute, at their utmost size, seldom above three parts of an inch long, and when gathered up into their usual form, not above a third even of those dimensions.

It was upon these minute animals, that the power of dissection was first tried in multiplying their numbers.—They had been long considered as little worthy the attention of observers, and were consigned to that neglect in which thousands of minute species of insects remain to this very day. It is true, indeed, that Reaumur observed, classed, and named them.—By contemplating their motions, he was enabled distinctly to pronounce on their being of the animal, and not of the vegetable kingdom; and he called them polypi, from their great resemblance to those larger ones that were found on the ocean. Still, however, their properties were neglected, and their history unknown.

Mr. Trembley was the person to whom we owe the first discovery of the amazing properties and powers of this little vivacious creature. He divided this class of animals into four different kinds; into those inclining to green, those of a brownish cast, those of a flesh-colour, those which he calls the *polype de panache*. The differences of structure in these, as also of colour, are observable enough; but the manner of their subsisting, of seizing their prey, and of their propagation is pretty nearly the same in all.

Whoever has looked with care into the bottom of a wet ditch when the water is stagnant, and the sun has been powerful, may remember to have seen many little transparent lumps of jelly, about the size of a pea, and flatted on one side; such also as have examined the under side of the broad-leafed weeds that grow on the surface of the water, must have observed them studded with a number of these little jelly-like substances, which were probably then disregarded, because their nature and history were unknown. These little substances, however, were no other than living polypi gathered up into a quiescent state, and seemingly inanimate, because either undisturbed, or not excited by the calls of appetite to action. When they are seen exerting themselves they put on a very different appearance from that when at rest; to conceive a just idea of their figure, we may suppose the finger of a glove cut off at the bottom; we may suppose also several threads or horns planted round the edge like a fringe. The hollow of this finger will give us an idea of the stomach of the animal; the threads issuing forth from the edges may be considered as the arms or feelers, with which it hunts for its prey. The animal, at its greatest extent, is seldom seen above an inch and a half long, but it is much shorter when it is contracted and at rest; it is furnished neither with muscles nor rings, and its manner of lengthening or contracting itself, more resembles that of the snail, than worms, or any other insect. The polypus contracts itself more or less, in proportion as it is touched, or as the water is agitated in which they are seen. Warmth animates them, and cold benumbs them; but it requires a degree of cold approaching congelation before they are reduced to perfect inactivity; those of an inch have generally their arms double, often thrice as long as their bodies. The arms, where the animal is not disturbed, and the season not unfavourable, are thrown about in various directions, in order to seize and entangle its little prey; sometimes three or four of the arms are thus employed, while the rest are contracted like the horns of a snail, within the animal's body. It seems capable of giving what length it pleases to these arms; it contracts and extends them at pleasure, and stretches them only in proportion to the remoteness of the object it would seize.

These animals have a progressive motion, which is performed by that power they have of lengthening, and contracting themselves at pleasure; they go from one part of the bottom to another; they mount along the margin of the water, and climb up the side of aquatic plants. They often are seen to come to the surface of the water, where they suspend themselves by the lower end. As they advance but very slowly, they employ a great deal of time in every action, and bind themselves very strongly to whatever body they chance to move upon as they proceed; their adhesion is voluntary, and is probably performed in the manner of a cupping-glass applied to the body.

All animals of this kind have a remarkable attachment to turn towards the light, and this naturally might induce an enquirer to look for their eyes; but however carefully this search has been pursued, and however excellent the microscope with which every part was examined, yet nothing of the appearance of this organ was found over the whole body; and it is most probable that, like several other insects which hunt their prey by their feeling, these creatures are unfurnished with advantages which would be totally useless for their support.

In the centre of the arms, as was said before, the mouth is placed, which the animal can open and shut at pleasure, and this serves at once as a passage for food, and an opening for it after digestion. The inward part of the animal's body seems to be one great stomach, which is open at both ends; but the purposes which the opening at the bottom serves are hitherto unknown, but certainly not for excluding their excrements, for those are ejected at the aperture by which they are taken in. If the surface of the body of this little creature be examined with a microscope, it will be found studded with a number of warts, as also the arms, especially when they are contracted; and these tubercles, as we shall presently see, answer a very important purpose.

If we examine their way of living, we shall find these insects chiefly subsisting upon others, much less than themselves, particularly a kind of millepedes that live in the water, and a very small red worm, which they seize with great avidity. In short, no insect whatsoever, less than themselves, seems to come amiss to them; their arms, as was said before, serve them as a net would a fisherman, or perhaps more exactly speaking, as a lime-twig does a fowler. Whenever their prey is perceived, which the animal effects by its feeling, it is sufficient to touch the object it would seize upon, and it is fastened without a power of escaping. The instant one of this insect's long arms is laid upon a millepede, the little insects sticks without a possibility of retreating. The greater the distance at which it is touched, the greater is the ease with which the polypus brings the prey to its mouth. If the little object be near, though irretrievably caught, it is not without great difficulty that it can be brought up to the mouth to be swallowed. When the polypus is unsupplied with prey, it testifies its hunger by opening its mouth; the aperture, however, is so small that it cannot be easily perceived; but when, with any of its long arms, it has seized upon its prey, it then opens the mouth distinctly enough, and this opening is always in proportion to the size of the animal which it would swallow; the lips dilate insensibly by small degrees, and adjust themselves precisely to the figure of their prey. Mr. Trembley, who took a pleasure in feeding this useless brood, found that they could devour aliments of every kind, fish and flesh, as well as insects; but he owns they did not thrive so well upon beef and veal, as upon the little worms of their own providing. When he gave one of these famished reptiles any substance which was improper to serve for aliment, at first it seized the prey with avidity, but after keeping it some time entangled near the mouth, it dropt it again with distinguishing nicety.

When several polypi happen to fall upon the same worm, they dispute their common prey with each other. Two of them are often seen seizing the same worm at different ends, and dragging it at opposite directions with great force. It often happens, that while one is swallowing its respective end, the other is employed in the same manner, and thus they continue swallowing each his part, until their mouths meet together; they then rest, each for some time in this situation, till the worm breaks between them, and each goes off with his share; but it often happens, that a seemingly more dangerous combat ensues, when the mouths of both are thus joined upon one common prey together: the largest polypus then gapes and swallows his antagonist; but what is very wonderful, the animal thus swallowed seems to be rather a gainer by the misfortune. After it has lain in the conqueror's body for about an hour, it issues unhurt, and often in possession of the prey which had been the original cause of contention; how happy would it be for men, if they had as little to fear from each other!

These reptiles continue eating the whole year, except when the cold approaches to congelation; and then, like most other of the insect tribe, they feel the general torpor of nature, and all their faculties are for two or three months suspended; but if they abstain at one time, they are equally voracious at another, and, like snakes, ants, and other animals that are torpid in winter, the meal of one day suffices them for several months together. In general, however, they devour more largely in proportion to their size, and their growth is quick exactly as they are fed; such as are the best supplied, soonest acquire the largest size, but they diminish also in their growth with the same facility, if their food be taken away.

Such are the more obvious properties of these little animals, but the most wonderful still remain behind: Their manner of propagation, or rather multiplication, has for some years been the astonishment of all the learned of Europe. They are produced in as great a variety of manners as every species of vegetable. Some polypi are propagated from eggs, as plants are from their seed; some are produced by buds issuing from their bodies as plants are produced by inoculation, while all may be multiplied by cuttings, and this to a degree of minuteness that exceeds even philosophical perseverance.

With respect to such of this kind as are hatched from the egg, little curious can be added, as it is a method of propagation so common to all the tribes of Insect Nature; but with regard to such as are produced like buds from their parent stem, or like cuttings from an original root, their history requires a more detailed explanation. If a polypus be carefully observed in summer, when these animals are chiefly active, and more particularly prepared for propagation, it will be found to bourgeon forth from different parts of its body several tubercles or little knobs, which grow larger and larger every day; after two or three days' inspection, what at first appeared but a small excrescence takes the figure of a small animal, entirely resembling its parent, furnished with feelers, a mouth, and all the apparatus for seizing and digesting its prey. This little creature every day becomes larger, like the parent, to which it continues attached; it spreads its arms to seize upon whatever insect is proper for aliment, and devours it for its own particular benefit; thus it is possessed of two sources of nourishment, that which it receives from the parent by the tail, and that which it receives from its own industry by the mouth. The food which these animals receive often tinctures the whole body, and upon this occasion the parent is often seen communicating a part of its own fluids to that of its progeny that grows upon it; while, on the contrary, it never receives any tincture from any substance that is caught and swallowed by its young. If the parent swallows a red worm, which gives a tincture to all its fluids, the young one partakes of the parental colour; but if the latter should seize upon the same prey, the parent polypus is no way benefited by the capture, but all the advantage remains with the young one.

But we are not to suppose that the parent is capable of producing only one at a time; several young ones are thus seen at once, of different sizes, growing from its body, some just budding forth, others acquiring their perfect form, and others come to sufficient maturity, and just ready to drop from the original stem to which they had been attached for several days. But what is more extraordinary still, those young ones themselves that continue attached to the parent, are seen to bourgeon, and propagate their own young ones also, each holding the same dependence upon its respective parent, and possessed of the same advantages that have been already described in the first connection. Thus we see a surprising chain of existence continued, and numbers of animals naturally produced without any union of the sexes, or other previous disposition of nature.

This seems to be the most natural way by which these insects are multiplied; their production from the egg being not so common; and though some of this kind are found with a little bladder attached to their bodies, which is supposed to be filled with eggs, which afterwards come to maturity, yet the artificial method of propagating these animal, is much more expeditious and equally certain: It is indifferent whether one of them be cut into ten, or ten hundred parts, each becomes as perfect an animal as that which was originally divided; but it must be observed, that the smaller the part which is separated from the rest, the longer it will be in coming to maturity, or in assuming its perfect form. It would be endless to recount the many experiments that have been tried upon this philosophical prodigy; the animal has been twisted and turned into all manner of shapes; it has been turned inside out, it has been cut in every division, yet still it continued to move; its parts adapted themselves again to each other, and in a short time it became as veracious and industrious as before.

Besides these kinds mentioned by Mr. Trembley, there are various others which have been lately discovered by the vigilance of succeeding observers, and some of these so strongly resemble a flowering vegetable in their forms, that they have been mistaken by many naturalists for such. Mr. Hughes, the author of the Natural History of Barbadoes, has described a species of this animal, but has mistaken its nature, and called it a sensitive flowering plant; he observed it to take refuge in the holes of rocks, and, when undisturbed, to spread forth a number of ramifications, each terminated by a flowery petal which shrunk at the approach of the hand, and withdrew into the hole from whence before it had been seen to issue. This plant, however, was no other than an animal of the polypus kind, which is not only to be found in Barbadoes, but also in many parts of the coast of Cornwall, and along the shores of the continent.

CHAPTER V.

OF THE LYTHOPHYTES AND SPONGES.

IT is very probable that the animals we see and are acquainted with, bear no manner of proportion to those that are concealed from us. Although every leaf and vegetable swarms with animals upon land, yet at sea they are still more abundant; for the greatest part of what would seem vegetables growing there, are in fact nothing but the artificial formation of insects, palaces which they have built for their own habitation.

If we examine the bottom of the sea along some shores, and particularly at the mouths of several rivers, we shall find it has the appearance of a forest of trees under water, millions of plants growing in various directions, with their branches entangled in each other, and sometimes standing so thick as to obstruct navigation. The shores of the Persian Gulf, the whole extent of the Red-sea, and the western coasts of America, are so choaked up in many places with these coraline substances, that though ships force a passage through them, boats and swimmers find it impossible to make their way. These aquatic groves are formed of different substances, and assume various appearances. The coral plants, as they are called, sometimes shoot out like trees without leaves in winter; they often spread out a broad surface like a fan, and not uncommonly a large, bundling head, like a faggot; sometimes they are found to resemble a plant with leaves and flowers; and often the antlers of a stag, with great exactness and regularity. In other parts of the sea are seen sponges of various magnitude, and extraordinary appearances, assuming a variety of phantastic forms, like large mushrooms, mitres, fonts and flower-pots. To an attentive spectator these various productions seem entirely of the vegetable kind; they seem to have their leaves and their flowers, and have been experimentally known to shoot out branches in the compass of a year. Philosophers, therefore, till of late, thought them selves pretty secure in ascribing these productions to the vegetable kingdom; and Count Marsigli, who has written very laboriously and learnedly on the subject of corals and sponges, has not hesitated to declare his opinion that they were *plants* of the aquatic kind, furnished with flowers and seed, and endued with vegetation entirely resembling that which is found upon land. This opinion however, some time after, began to be shaken by Rumphius and Jussieu, and at last by the ingenious Mr. Ellis, who by a more sagacious and diligent inquiry into Nature, put it past doubt that corals and sponges were entirely the work of animals, and that like the honey-comb, which was formed by the bee, the coral was the work of an infinite number of reptiles of the polypus kind, whose united labours were thus capable of filling whole tracts of the ocean with those embarrassing tokens of their industry.

If in our researches after the nature of these plants, we should be induced to break off a branch of the coraline substance, and observe it carefully, we shall perceive its whole surface, which is very rugged and irregular, covered with a mucous fluid, and almost in every part, studded with little jelly-like drops, which, when closely examined, will be found to be no other than reptiles of the polypus kind. These have their motions, their arms and their appetites, exactly resembling those described in the last chapter, but they soon expire when taken out of the sea, and our curiosity is at once stopped in its career, by the animals ceasing to give any mark of their industry; recourse, therefore, has been had to other expedients, in order to determine the nature of the inhabitants as well as the habitation.

If a coraline plant be strictly observed, while still growing in the sea, and the animals upon its surface be not disturbed, either by the agitation of the waters or the touch of the observer, the little polypi will then be seen in infinite numbers, each issuing from its cell, and in some kinds the head covered with a little shell, resembling an umbrella, the arms spread abroad, in order to seize its prey, while the hinder part still remains attached to its habitation, from whence it never wholly removes. By this time it is perceived that the number of inhabitants is infinitely greater than was at first suspected: and that they are all assiduously employed in the same pursuits, and that they issue from their respective cells, and retire into them at pleasure. Still, however, there are no proofs that those large branches which they inhabit are entirely the construction of such feeble and minute animals. But chymistry will be found to lend a clue to extricate us from our doubts in this particular.—Like the shells which are formed by snails, muscles, and oysters, these coraline substances effervesce with acids, and may therefore well be supposed to partake of the same animal nature. But Mr. Ellis went still farther, and examined their operations, just as they were beginning. Observing an oyster-bed which had been for some time neglected, he there perceived the first rudiments of a coraline plantation, and tufts of various kinds shooting from different parts of this favourable soil. It was upon these he tried his principal experiment. He took out the oysters which were thus furnished with coralines, and placed them in a large wooden vessel, covering them with sea-water. In about an hour, he perceived the animals, which before had been contracted by handling and had shown no signs of life, expanding themselves in every direction, and appearing employed in their own natural manner. Perceiving them, therefore, in this state, his next aim was to preserve them thus expanded, so as to be permanent objects of curiosity. For this purpose, he poured, by slow degrees, an equal quantity of boiling water into the vessel of sea-water in which they were immersed. He then separated each polypus with pincers from its shell, and plunged each separately into small crystal vases, filled with spirits of wine mixed with water. By this means, the animal was preserved entire, without having time to contract itself, and he thus perceived a variety of kinds, almost equal to that variety of productions which these little animals are seen to form. He has been thus able to perceive and describe fifty different kinds, each of which is seen to possess its own peculiar mode of construction, and to form a coraline that none of the rest can imitate. It is true, indeed, that on every coraline substance there are a number of polypi found, no way resembling those which are the erecters of the building; these may be called a vagabond race of reptiles, that are only intruders upon the labours of others, and that take possession of habitations, which they have neither art nor power to build for themselves. But in general, the same difference that subsists between the honey-comb of the bee, and the paper-like cells of the wasp, subsists between the different habitations of the coral-making polypi.

With regard to the various forms of these substances, they have obtained different names from the nature of the animal that produced them, or the likeness they bear to some well-known object, such as coralines, fungi-madrepores, sponges, astroites and keratophytes. Though these differ extremely in their outward appearances, yet they all are formed in the same manner by reptiles of various kinds and nature. When examined chymically, they all discover the marks of animal formation; the corals, as was said, dissolve in acids, the sponges burn with an odour stongly resembling that of burnt horn. We are left somewhat at a loss with regard to the precise manner in which this multitude of cells, which at last assume the appearance of a plant or flower, are formed.

If we may be led in this subject by analogy, it is most probable, that the substance of coral is produced in the same manner that the shell of the snail grows round it; these little reptiles are each possessed of a slimy matter, which covers its body, and this hardening, as in the snail, becomes a habitation exactly fitted to the body of the animal that is to reside in it; several of these habitations being joined together, form at length a considerable mass, and as most animals are productive in proportion to their minuteness, so these multiplying in a surprising degree, at length form those extensive forests, that cover the bottom of the deep.

Thus all Nature seems replete with life; almost every plant on land has its surface covered with millions of these minute creatures, of whose existence we are certain, but of whose uses we are entirely ignorant; while numbers of what seem plants at sea are not only the receptacles of insects but also entirely of insect formation. This might have led some late philosophers into an opinion, that all Nature was animated; that every, even the most inert mass of matter, was endued with life and sensation, but wanted organs to make those sensations perceptible to the observer : those opinions, taken up at random, are difficultly maintained, and as difficultly refuted ; like combatants that meet in the dark, each party may deal a thousand blows without even reaching the adversary. Those, perhaps, are wiser who view Nature as she offers ; who without searching too deeply into the recesses in which she ultimately hides, are contented to take her as she presents herself, and storing their minds with effects rather than with causes, instead of the embarrassments of systems, about which few agree, are contented with the history of appearances, concerning which all mankind have but one opinion.

INDEX.

The Roman character denotes the volume—the Arabic number the page

ABDOMINAL FISH, has the ventral nearer the tail than the pectoral fins, iii. 286.

Abstemious life, its great benefit, i. 235.

Abstinence, religiously observed long after the Reformation; Queen Elizabeth's injunctions upon this head; a heavenly institution, from its benefit to individuals and advantage to society, i. 208; remarkable instance of it in the sloth, iii. 22.

Acanthopetrigii, a name of the prickly-finned fish, iii. 283.

Acorn, a shell-fish, iv. 45; the shell of the acorn filled by an immoveable animal, 209.

Adriatic, its empire claimed by the republic of Venice, i. 96.

Ælian, his account of the dreadful cavern called the Gulf of Pluto, i. 31; see *Elephant*, ii. 273.

Ætna, volcano in Sicily; remarkable eruption in 1537; an account of it; the burning seen at Malta, i. 42; the quantity of matter discharged, supposed to exceed twenty times the original bulk of the mountain; walls built of materials thrown up by it, 47.

Æolipile, an instrument to produce artificial wind; its description, and the manner of generating violent blasts, i. 135.

Africa, its sandy storms, i. 145; destroy villages and armies, 146; see *Animals*, 279.

Age, the mountains of Scotland, Wales, Auvergne, and Switzerland, furnish more instances of old age, than the plains of Holland, Flanders, Germany, or Poland, i. 237.

Agouti, an animal found in great abundance in South America, and by some called the rabbit of that continent; it resembles the rabbit, yet is different from ours, and peculiar to the new world; it has the hair and the voraciousness of the hog; eats greedily and hides the remainder; burrows in hollow trees; how hunted and forced out of its hole; it turns in its own defence upon the hunters; its bite and cry; how tamed; bears two young at each litter; breeds at least twice a year; carries its young about like a cat; and lodges them in a tree, where they soon become able to provide for themselves, ii. 196, 197.

Agricola, has seen hats made of mole skins, most beautiful, ii. 215.

Agriculture, the number of hands employed in the manufacture of silk, turned to agriculture, would increase the quantity of corn to more than an equivalent for the diminution of national wealth in purchasing wrought silk from other countries. See *Silkworm*.

Ai, a name of the sloth; its description, iii. 21.

Aicurous, a great parrot; its sagacity and docility, iii. 129.

Aigues-mortes, a town in France, a port in the time of St. Louis; now removed more than four miles from the sea, i. 113.

Air, the only active agent in earthquakes, i. 47; Amonton's calculation of a moderate degree of heat sufficient to give the air amazing powers of expansion, 48; too fine for our sight, is very obvious to our touch; its elasticity; a cubic foot of air weighs more than an ounce, 121, 122; a hand upon the mouth of a vessel from which the air has been exhausted, is violently sucked inwards, and why, 122; the mouth of such vessel inverted being immersed, the water will rise into the empty space, and fill the glass; the manner in which this is done; water never ascends higher than thirty-two feet; our ordinary load of air amounts nearly to forty thousand pounds, 123; four thousand pounds weight of air carried at one time more than at another, and why; the air contained in a nut-shell, may be dilated into unknown dimensions; the air contained in a house, may be compressed into a cavity equal to the eye of a needle; the increasing elasticity of compressed air augmented by heat, would, when expanded, be sufficient for the explosion of a world, 123; one of the most compounded bodies in nature, 126; scarce any substance resisting its corroding qualities, 127; factitious air produced in great quantities from vegetable, animal, or mineral substances; proves a greater enemy to animals than a vacuum; a bird enclosed in artificial air, from raisins, died in a quarter of a minute, a frog included in artificial air; a snail put into the receiver, with air of paste, died in four minutes, 128; to be wholesome, should not be of one kind, but a compound of several substances, 129; how air contributes to the support of our lives; dispute upon it, 133, 134; gives life and body to flame, 134; kindles fire into flame, moderates the rays of light, and dissipates their violence; conveyance of sound; all the pleasure received from conversation or from music, depends entirely upon the air; odours are diffused by the air, 135; vegetables, or the bodies of animals left to putrefy, produce air in a very copious manner; it finds admission into wine or other fermented liquors, and most easily into spirits of wine; mountains, minerals, vegetables, animals, and fires contribute to increase a current of air, 136; a tide of air produced by the sun and moon; a current of air, driven through a contracted space, grows more violent and irresistible, 142.

Air-bladder, in fishes described, iii. 236.

Air-pump, See *Carp*, iii. 231 to 238. See ***Fishes***, iii. 237, &c.

Albatros, a bird of the gull kind; its description by Edwards; is an inhabitant of the tropical climates, and other regions, as far as the straits of Magellan in the South Seas; is the most fierce and formidable of the aquatic tribe; it chiefly pursues the flying-fish, forced from the sea by the dolphins; Wiquefort's account of this bird; it seems to have a peculiar affection for the penguin, and a pleasure in its society; its nest, iii. 195, 196.

Albouras, a famous volcano near Mount Taurus, i. 45.

Alder, hares will not feed on the bark of it, ii. 179.

Algazel, the seventh variety of gazelles with Mr. Buffon, ii. 53

Aldrovandus, places the bats among birds, ii. 229; he having spent a fortune to enlighten mankind, and collected more truth and falsehood than any man, was reduced to want, to suffer ingratitude, and to die in an hospital, iii. 217.

Alexander's soldiers agitated by curiosity and apprehension at the tides in the river Indus, i. 105.

Alligator, or the *Cayman*, a kind of crocodile, iv. 64.

Alps, dreadful chasms found in them, i. 30; Pope's description of a traveller straining up the Alps, 62; the highest point of them not above sixteen hundred toises above the surface of the sea, 66.

Amazons, the greatest river in the world, has its source among the Andes, i. 62; its course from its origin, in the lake of Lauricocha, to its discharge in the Western Ocean, is more than twelve hundred leagues; its discharge is through a channel of a hundred and fifty miles broad, after receiving above sixty considerable rivers, 91.

Ambergris, long considered as a substance found floating on the sea, but since discovered to belong to the cachalot; the balls of ambergris found in all fishes of this kind, but chiefly in the oldest and strongest, iii. 254.

Ambrose, (*St.*) his credulity concerning the halcyon, iii. 226.

America, exceeds in the size of its reptiles, but is inferior in its quadrupeds, i. 284; that part of the American continent which lies under the line, is cool and pleasant, 247, the cause of the tawny colour of the North American Indians; they paint their skins with red ochre, and anoint them with the fat of bears, 249; the original cause of their flat heads, 250; American wood-duck described, iii. 221. See *Tapir*, i. 284. See *Quadrupeds*, i. 285. See *Dog*, ii. 129. See *Rats*, ii. 205. See *Rabbits* (Syrian), ii. 178. See *Bats*, ii. 233. See *Savages*, ii. 266. See *Pacos*, iii. 11. See *Mock-bird*, iii. 145.

Amia, or *Bonito*, description of this fish, iii. 288.

Ammodytes, or the *Lance*, a fish; its description, iii. 287.

Ammodytes, a kind of viper; it darts with amazing swiftness, iv. 88.

Amonton. See *Air*, i. 48.

Amour, a river of Eastern Tartary, i. 88; it receives about forty lesser rivers, 91.

Amphesbæna, or the double-headed serpent, iv. 101.

Anarchicas, the wolf-fish, its description, iii. 287.

Anatomists, See *Apes*, i. 276. See *Lamprey*, iii. 272.

Anchovy, has no bladder, iii. 237.

Andalusia, gennets of that province the best, ii. 11.

Andes, amazing chasms or fissures in them; some of these are a mile wide, and others running under ground, resemble a province, i. 31; the highest mountains of the world, 45; excellent description of them by Ulloa; the Andes are, by measure, three thousand one hundred and thirty-six toises, or fathoms, above the surface of the sea, 65; at the top no difficulty of breathing perceived, 66; manner of mules going down the precipices, ii. 22.

Anemometer, an instrument to measure the velocity of the wind; gives no certain information of the force of a storm, i. 143.

Angora, the cat of Angora, ii. 104, 105; the goat of Angora; a number of animals about Angora, affording hair for trade; the camblet made of such hair. 47.

Anhima, a bird of the crane kind, of Brasil, iii. 169; described; the cock and the hen prowl together; when one dies the other stays by it, and dies also, 170.

Animals, hold the first rank amidst the infinitely different productions the earth offers; are endowed with powers of motion and defence, even those fixed to one spot; organized beings provided with some defence for their own security; endued with life and vigour; some, by nature, violent; have their enmities and affections; ultimately supported upon vegetables; those in a dry sunny climate strong and vigorous; different vegetables appropriated to the different appetites, and why; of domestic kinds, carried from milder countries into the northern climates, quickly degenerate and grow less; in the internal parts of South America and Africa grow to a prodigious size, and why; not so in the cold frozen regions of the North; the most perfect races have the least similitude to the vegetable productions on which they are ultimately fed; the meaner the animal, the more local; assume different habits as well as appearances, and why; some peculiar to every part of the vegetable system; there are that live upon other animals; this wisely so constituted; to diminish the number of animals, and increase that of vegetables, the general scope of human industry; of the vast variety, very few serviceable to man; in a catalogue of more than twenty thousand land animals, scarcely a hundred are any way useful to man; expediency of man's living upon animals as well as vegetables; little more known than that the greatest number require the concurrence of a male and female to reproduce their kind; and these, distinctly and invariably, found to beget creatures of their own species, i. 161 to 166; usual distinction, with respect to their manner of generation, into oviparous and viviparous kinds, 168; the warmth of the sun, or of a stove, efficacious in bringing the animal in the egg to perfection, 170; such parts as the animal has double, or without which it can live, are the latest in production, 173; De Graaf has attended the progress and increase of various animals in the womb, and minutely marked the changes they undergo, 174; that which, in proportion to its bulk, takes the longest time for production, the most complete when finished; of all others, man the slowest in coming into life; the most formidable are the least fruitful, and why; those which bring forth many engender before they have arrived at half their natural size; approach more to perfection, whose generation nearly resembles that of man, 178, 179; men and apes the only that have eye-lashes upon the upper and lower lids, all others want them on the lower lid, 192; that which has most desires appears capable of the greatest variety of happiness, 206; those of the forest remain without food several weeks; all endure the want of sleep and hunger with less injury to health than man; nature contracts the stomachs of carnivorous animals of the forest to suit them to their precarious way of living; but the meaner tribes are still more capable of sustaining life without food, 207; some lower animals seem to spend the greatest part of their lives in sleep, 210; some affected by music; instances of it, 211; those furnished with hands have more understanding than others, 230; in general, the large animals live longer than the small, 235; difference between animals in a state of nature and domestic tameness, so considerable that Mr. Buffon makes it a principal distinction of classes, 271; their teeth fitted to the nature of their food; and their legs as well fitted to their respective wants or enjoyments; those who chew the cud have four stomachs; several that with us have four stomachs, have but two in Africa; no carnivorous animal, except the dog, makes a voluntary attack but with superiority; the stomach generally proportioned to the nature of the food, or the ease with which it is obtained; the size of the intestines proportioned to the nature of the food; few of the wild sort seek their prey in the day-time; in proportion as each carnivorous animal wants strength, it uses all the assistance of patience, assiduity, and cunning; some animals carefully avoid their enemies by placing sentinels to warn of the approach of danger, and know how to punish such as have neglected their post, or been unmindful of the common safety; animals feeding only upon grass, rendered carnivorous; two instances, 278 to 282; Africa ever remarkable for the fierceness of its animals; the smallest multiply the fastest; the larger sort bring few at a time; seldom generate till they be near their full growth; those which bring many reproduce before they arrive at half their natural size; with all animals, the time of their pregnancy is proportioned to their size; in all kinds, the intermediate litters the most fruitful; the first and last generally produce the fewest in number and worst of kind; natural instinct to choose the proper times of copulation; whatever the natural disposition of animals, they have all courage to defend their young; instances of it; milk in the carnivorous animals more sparing than in others; choice of situation in bringing forth, remarkable in animals, 281 to 286; the ass, in a state of tameness, the most gentle and quiet of all animals, ii. 19; of all animals covered with hair, the ass the least subject to vermin, 21; the zebra the most beautiful, but the wildest animal in nature, 22; perfectly know their enemies, and how to avoid them; instances of it, 24; best method of classing animals adapted to 275 the carnivorous seek their food in gloomy solitude; they are sharper than the ruminating kind, and why; ruminating animals most harmless, and most easily tamed. generally go in herds, for their mutual security; live entirely upon vegetables; the meanest of them unite in each others defence; carnivorous animals have small stomachs and short intestines; ruminating animals naturally more indolent and less artful than the carnivorous kinds, and why; their bowels considered as an elaboratory. with proper vessels in it; nature enlarges the capacity of their intestines to take in a greater supply; and furnishes them with four stomachs; the names of these four stomachs; the intestines of carnivorous animals are thin and lean; but those of the ruminating sort strong, fleshy, and well covered with fat; of all others, man spends the least time in eating; of all ruminant animals the cow-kind deserve the first rank. ii. 28 to 30; naturalists give various names to the same, only differing in accidental circumstances; of all, except man, the cow most extensively propagated; greatest variety among cows; one animal of the cow-kind, no naturalist has hitherto described, it may be added as a third species; description of it; all the ruminant internally much alike; those that take refuge under the protection of man, in a few generations become indolent and helpless; the sheep, in a domestic state, the most defenceless and inoffensive; also the most stupid, 35 to 41; a great number and variety about Angora; the inhabitants drive a trade with their hair, 47; the kinds actually not distinguished by the horns, colour, position of the ears, or fineness of the hair, 48; the fat, urine, beak, and even dung of various animals efficacious in some disorders, 52; of all in the world, the gazelle has the most beautiful eye, 53; scarce one animal, except the carnivorous, that does not produce concretions in the stomach, intestines, kidneys, bladder, or in the heart, 54; no naturalists inform us whether that which bears the musk, be a ruminant, or of the hog-kind, 60; by a general rule, every animal lives about seven or eight times the number of years it continues to grow, 64; of all natives of this climate, none have such a beautiful eye as the stag, 64; no two more nearly allied than the stag and the fallow deer, yet form distinct families, and never engender together, 72; many that once flourished in the world, may now be extinct, 76; of all the deer-kind the rein-deer the most extraordinary, and most useful, 81; of all, when young, none more prettily playful than the kitten, 101; many in Syria and Persia remarkable for long soft hair; most terrestrial are larger, fiercer, and stronger, in warm than in cold or temperate climates, 105; the only not afraid singly to make opposition to the lion, are the elephant, the rhinoceros, the tiger, and the hippopotamos, 111; of all American, the tiger the most formidable and mischievious, 117; the generality have greater agility, greater swiftness, and more formidable arms, from nature, than man; and their senses, particularly that of smelling, are far more perfect; those living upon flesh hunt by nature, 128; all under the influence of man, are subject to great variations, 130; many in this country bred between a dog and a fox, 137; all savage, that have once tasted human flesh, never refrain from pursuing mankind, 157; those of the north, in winter, are more hairy, than those of milder climates; and what the cause, 158; of the arctic climates, have their winter and summer garments, except as far north as Greenland, 159; of the weasel kind, the martin, the most pleasing, 163; feeding entirely upon vegetables, are inoffensive and timorous, 177; remarkable for speed; except the horse, have the hind feet longer than the fore; none receives the male when pregnant except the hare, 178; hares the only that have hair on the inside of their mouths, 179; few of the wild kind have so many varieties as the squirrel, 187; all are tamed, more difficultly in proportion to their cowardice, 205; in all countries, civilized and improved, the lower ranks of animals repressed and degraded, 237; the beaver the only that in its fore parts resembles a quadruped, and in its hinder parts approaches the nature of fishes, 238; a true judgment of their disposition by their looks, and a just conjecture of their internal habits from their external form, 257; the lori of all others the longest, in proportion to size, 269; the camel the most temperate of all, iii. 6; the ostrich the most voracious, 47; of all that use their wings and legs in running, the ostrich is the swiftest, 49; none has greater courage than the cock, opposed to one of his own species, 77; the presence of man destroys the society of meaner animals, and their instincts also, 197; those longest in the womb, are the longest lived, according to Pliny, 217; none harder to be killed than the shark, 263; the snail kind are hermaphrodites, iv. 33; of all four-footed, the frog the best swimmer, 49; the caterpillar has the greatest number of enemies, 167; whatever kind, long under the protection of man lose part of their natural sagacity, in providing for themselves, 181; that which fills the acorn shell is immoveable, 209; a most numerous tribe lately discovered, propagated by cuttings; many entirely without motion; all seemed possessed of one power, of which vegetables are totally deficient; certain races of animals fall beneath vegetables, by their more imperfect propagation, 209; some live without limbs, and often reproduce them; some live without brain for many weeks together;

by Ray, Klein, and Linnæus. i. 270, 271; the author's method of classing them, 272 some increase and grow large, though all their nobler organs are entirely destroyed; some continue to exist though cut in two, their nobler parts preserving life, while the others perish that were cut away; the zoophyte tribe, continues to live in separate parts, and one animal, by the means of cutting, is divided into two distinct existences, sometimes into a thousand, 212; the first discovery of the power of reproduction in animals owing to Mr. Trembley, 213.

Antelope, tenth variety of gazelles by Mr. Buffon; its description; the Indian antelope, ii. 55.

Antilles. See *Negroes*, i. 227.

Antlers, their distinct names, ii. 68.

Antiparos, its grotto most remarkable, i. 33, 34.

Antipathy, many have it to some animals, whose presence they instantly perceive by the smell, i. 228; no animals more alike than the cow and the buffalo, yet none have stronger dislikes to each other, ii. 36; dogs and wolves so different in their dispositions, that no animals can have a more perfect antipathy, 141; the same subsists between the jackal and the dog, 152; of the marmout to the dog, 192; quadrupeds which have natural antipathy against the Norway rat, 204; between the porcupine and serpent so irreconcileable as never to meet without a mortal engagement, 220.

Antiquity, most naturally looked up to with reverential wonder, i. 259.

Anthony, (*St.*) lived a hundred and five years, i. 209.

Ants, every writer of antiquity describes this insect, as labouring in the summer, and feasting upon the produce during the winter; in some of the warmer climates this may be so; but in France and England they are in a state of torpidity during winter; common ants of Europe; their description; fears not to attack a creature ten times its own magnitude; are divided into males, females, and neutral or working tribe; amazing number and regularity of their cells; depredations and adventures; they live under strict regulations; order in which they sally forth; often quit their dwelling in a body, and go in quest of adventures; an instance of it given by Smith; their sting produces extreme pain, iv. 192 to 197; drive the hare from its form, ii. 182; many animals live upon ants in Africa and America, iii. 18.

Ant-eater, or *Ant-bear*, description and habits, iii. 19; their art to catch the ants· manner of defence against its enemies; kills the invader, and remains fastened upon him with vindictive desperation, 20.

Ant-lion, the, iv. 136.

Antioch, buried by an earthquake, i. 50

Aorta, the great artery, i. 156.

Aperea, by some the Brazilian rabbit; its description, ii. 198.

Apes, have eye-lashes upon the upper and lower lids, i. 192; the only animal possessed of hands and arms, 198; in some of the kinds the resemblance to man so striking, that anatomists are puzzled to find in what part of the human body man's superiority consists; enjoy many advantages in common with men, above the lower tribes of nature, 276; the foremost of the kind is the ouran-outang, or wild man of the woods, ii. 250; description of this animal by Dr. Tyson; comparative view of this creature with man; another description of it by Mr. Buffon; two young ones, only a year old, discovered an astonishing power of imitation, 251 to 253; a kind called baris, properly instructed when young, serve as useful domestics; Le Comte's account of an ape in the Straits of Molucca, 253; the long-armed ape an extraordinary and remarkable creature, 256, its description; a native of the East Indies, and found along all the coasts of Coromandel, 257; fling themselves from one rope to another, at thirty, forty, and fifty feet distance, 254; instances of amazing nimbleness; in a state of nature they run upon all fours; certain proofs, of it, 256; in the navies of Solomon, among the articles imported from the East, are apes and peacocks, iii. 91.

Apicius, noted for having taught to mankind to suffocate fish in Carthaginian pickle, iii. 240; his receipt for making sauce for the ostrich, 49; manner of dressing a hare in true Roman taste, ii. 183.

Apodal, the name of the fish without ventral-fins, iii. 284.

Appendices, in the intestines of birds, iii. 33.

Appetite, Nature, by supplying a variety, has multiplied life in her productions, iii. 57

Arabia, its sandy tempests described, i. 145; men and animals buried in the sands of Arabia, preserved from corruption, for several ages, as if actually embalmed, 262; the ass originally a native of Arabia. See *Horses*, ii. 7 to 23. See *Camel*, iii. 6.

Archimedes, discovered the method of determining the purity of gold, by weighing in water, i. 80

Archipelago, very good horses in its islands, ii. 12; the wild ass found in these islands, particularly in Cerigo, 18.

Ardebil, the pastures in those plains excellent for rearing horses, ii. 12.

Arequipa, a celebrated burning mountain in Peru, i. 45.

Argentine, description of this fish, iii. 288.

Arion, his harp gathered the dolphins to the ship's side. i. 223.

Aristotle's opinion about the formation of the incipient animal, i. 66; and males being sometimes prolific, ii. 17.

Arlotto, an Italian Franciscan friar; for his sleeping transgressions, taken before the Inquisition, and like to be condemned for them, i. 213.

Armadillo or *Tatou*, generally referred to the tribe of insects or snails, i. 277; an inhabitant of South America; a harmless creature, furnished with a peculiar covering for its defence; attacked without danger, and liable to persecutions; is of different sizes, in all, however, the animal is partially covered with a coat of mail; a striking curiosity in natural history; has the same method of protecting itself as the hedgehog or pangolin; when attacked, rolls itself up in its shell, like a ball, and continues so till the danger is over; the Indians take it in this form, lay it close to the fire, and oblige it to unfold; this animal utterly unknown before the discovery of America; does mischief in gardens; bears the cold of our climate without inconvenience; the mole does not burrow swifter than the armadillo; burrows deep in the earth; expedients used to force them out; manner of taking them alive; sometimes in snares by the sides of rivers, and low, moist places, which they frequent; never found at a distance from their retreats; escapes by rolling itself up, and tumbling down from rock to rock, without danger or inconvenience; its food; scarce any that do not root the ground like a hog: kind of friendship between them and the rattlesnake; they are frequently found in the same hole; they all resemble each other, as clothed with a shell, yet differ in size, and in the division of their shell; the various kinds; the pig-headed sort, the weasel-headed, the kabassou, and the encoubert are the largest, ii. 225 to 228.

Arno, the river, a considerable piece of ground gained at the mouth of it, i. 112.

Aro, numbers of birds of paradise seen there, iii. 122.

Arse-feet, name our sailors give to birds of the penguin tribe, i. 200.

Arsenius, tutor to the emperor Arcadius, lived a hundred and twenty years, i. 209.

Arts, faults that have infected most of our dictionaries and compilations of natural history, i. 275; teaching the arts of cruelty equivalent to committing them, iii. 88.

Asia, aim of the Asiatics to possess many women, and to furnish a seraglio their only ambition, i. 187; lustre of jewels and splendour of brilliant colours eagerly sought after by all conditions of men, 197.

Asia Minor, description of its inhabitants, i. 246.

Asiatic, the olive-coloured, claims the hereditary resemblance to our common parent; an argument to prove the contrary, i. 250, 251.

Asp, a kind of serpent, iv. 9.

Asphaltum, an injection of petreoleum and an application of asphaltum suffice to make a mummy, i. 267.

Ass and horse, though nearly alike in form, are distinct kinds, different in natures; with only one of each kind, both races would be extinguished; in the state of nature entirely different; wild ass in greater abundance than the wild horse; wild ass and the zebra a different species; countries where the wild ass is found; some run so swift, few coursers can overtake them; caught with traps; taken chiefly for the flesh and skins, which make that leather called shagreen; entertainment of wild asses in Persia seen by Olearius; the delicacy of its flesh a proverb there; Galen deems it unwholesome; asses originally imported into America by the Spaniards, have run wild, and multiplied in such numbers as to be a nuisance; chase of them in the kingdom of Quito; have all the swiftness of horses; declivities and precipices do not retard their career; after the first load their celerity leaves them, their dangerous ferocity lost, and they contract the stupid look and dulness peculiar to the assinine species; will not permit a horse to live among them; always feed together; and a horse straying where they graze, they fall upon, bite, and kick him till he be dead; their preference to any vegetable is to the plantain; they drink as soberly as they eat, and never dip the nose into the stream; fear to wet their feet, and turn out to avoid the dirty parts of a road; show no ardour but for the female, and often die after covering; scent an owner at a distance, and distinguish him in a crowd; with eyes covered, they will not stir a step; when laid down, one eye covered with the grass, and the other hidden with a stone, or other contiguous body, they will not stir, or attempt to rise, to get free from impediments; several brought up to perform, and exhibited at a show; suffered to dwindle every generation, and particularly in England; bulk for bulk, an ass stronger than a horse, and surer footed; also less apt to start than the horse; more healthy than the horse; Persians cleave their nostrils to give them more room for breathing; Spaniards alone know the value of the ass; the Spanish jack-ass above fifteen hands high; the ass originally a native of Arabia; warm climates produce the largest and the best; entirely lost among us during the reign of queen Elizabeth; Hollingshed pretends our land yields no asses, yet they were common in England before that time; in Sweden they are a sort of rarity; but the last history of Norway, they had not reached that country; in Guinea, they are larger and more beautiful than the horses of that country; in Persia are two kinds, some sold for forty or fifty pounds; no animal covered with hair less subject to vermin; lives till twenty or twenty-five; sleeps less than the horse, and never lies down for it, unless much tired; she-ass crosses fire and water to protect her young; the gimerro bred between the ass and the bull; the size and strength of our asses improved by importation of Spanish jack-asses, 17 to 22; destroyed by the South American bat, called vampyre, ii. 233.

Assafœtida, savage nations delighted with the smell, i. 228.

Assiniboils, lake, where the river St. Lawrence takes its rise, i. 90.

Astroites, among coral substances, iv. 222.

Atalantis, an island submersed, was as large as Asia Minor and Syria; the fruits of the earth offered without cultivation, i. 58, 59.

Athanatus, instance of his strength, i. 204.

Athelstan, prohibited the exportation of mares and stallions, except as presents, ii. 15.

Athenians, had their cock-matches, iii. 87. See *Quail-fighting*, iii. 106.

Atherine, description of this fish, iii. 288.

Atmosphere, most disorders incident to mankind, says Bacon, arise from changes in the atmosphere, iii. 237.

Attraction, defined; the sun possessed of the greatest share, i. 10.

Avosetta, or scooper, a bird found in Italy; now and then comes over into England; its description, and extraordinary shape of its bill, iii. 181.

Aurelia, one of the appearances of the caterpiller, iv. 154 to 158; laying it in a warm room, Mr. Reaumur hastened the disclosure of the butterfly, and by keeping it in an ice-house, retarded it; though it bears a different appearance, it contains all the parts of the butterfly in perfect formation; some insects continue under that form not above ten days, some twenty, some several months, others for a year together, 161; how the butterfly gets rid of that covering, 162; aurelia of the bee different from that of the common caterpillar, 180.

Aurora Borealis, or northern light, streams with peculiar lustre, and a variety of colours round the pole; its appearance almost constant in winter; and when the sun departs for half a year, this meteor supplies its beams, affording light for all the purposes of existence, i. 154.

Aurora, or the samiri, the smallest and most beautiful of the sapajou monkeys; its description; is very tender, delicate, and held in high price, ii. 268.

Auvergne, in France, an amazing mummy dug up at that place, i. 266.

Auk, a bird bred in the island of St. Kilda, iii. 210.

Axis, a kind of beautiful stag; its description, ii. 71.

Azores, serpents, adders, and snakes seen about these islands by Sir Robert Hawkins in 1580, i. 99.

B.

Baboon, survey of the baboon kind, ii. 250; fierce, malicious, ignorant, and untractable: its description; impelled by a hatred for the males of the human species, and a desire for women; the Chevalier Forbin relates, that in Siam, whole troops will sally forth, plunder the houses of provisions, and endeavour to force the women; manner of robbing an orchard or vineyard at the Cape of Good Hope; the female brings forth one at a time, carries it in her arms, clinging to her breast; at the Cape of Good Hope, the young of these animals are taught to guard houses, and perform the duty with punctuality; they seem insensible of the mischief they do; a baboon described by Mr. Buffon; lasciviousness predominant; their food; are not found to breed in our climate; are not carnivorous; their liver, like that of a dog, divided into six lobes; the largest of the kind is the mandril; its description; displeased, it weeps like a child; is a native of the Gold Coast; that called Wandorow chiefly seen in the woods of Ceylon and Malabar; its description; the Maimon of Buffon, by Edwards called the pig-tail, the last of the sort; its description; a native of Sumatra, ii. 257 to 260.

Baby, the name of a dwarf, whose complete history is very accurately related by Mr. Daubenton, i. 255.

Babyrouessa, the Indian hog; its description; travellers call it the hog of Borneo: in what manner it escapes the pursuers; has enormous tusks of fine ivory; less dangerous than the wild boar; the tusks have points directed to the eyes, and sometimes grow into them; these animals, in a body, are seen with the wild boars, with which they are not known to engender; are easily tamed; have a way of reposing different from other animals of the larger kind, by hitching one of their upper tusks on the branch o a tree, and suffering their whole body to swing down at ease; they are fierce and terrible when offended, and peaceable and harmless when unmolested; their flesh good to be eaten, but said to putrefy in a short time; they chiefly live upon vegetables and the leaves of trees; are found in the island of Borneo, and in other parts of Asia and Africa, ii. 97 to 99.

Bacon's observations upon fishes, iii. 237.

Badger, a solitary, stupid animal; forms a winding hole, and remains in safety at the bottom; the fox takes possession of the hole quitted by the badger, or forces it from the retreat by wiles; surprised by the dogs at a distance from its hole, it fights with desperate resolution; all that has life is its food; it sleeps the greatest part of its time, and though not voracious, keeps fat, particularly in winter; it keeps the hole very clear; the female makes a bed of hay for her young; brings forth, in summer, three or four young; how she feeds them; the young are easily tamed; the old are savage and incorrigible; are fond of fire, and often burn themselves dangerously; are subject to the mange, and have a gland under the tail, which scents strongly; its flesh rank and ill-tasted, iii. 15.

Bag, name of the false belly of the opossum; its description, ii. 270, 271.

Bag, or pouch of the civet. See *Civet*, ii. 171.

Bait, the best for all kinds of fish is fresh herring; the larger sort will take a living small fish upon the hook sooner than any other bait, iii. 267.

Balance, to determine the specific gravity of metals, i. 80.

Balearic crane, its description; the real crane of Pliny; comes from the coast of Africa and Cape de Verd islands; has been described by the name of sea-peacock; foreign birds of the crane kind described, the jabiru, the jabiruguacu, the anhima, and the buffoon-bird, iii. 168 to 171.

Ball of fire of the bigness of a bomb; its effects, i. 152.

Baltic, the Danes in possession of it, i. 96.

Banks, of a river, after inundations, appear above water, when all the adjacent valleys is overflown, and why, i. 84.

Banana, the elephant eats the plant to the roots, ii. 276.

Barb, an Arabian horse bred in Barbary, ii. 10.

Barbs, of the whale, or whale-bone, iii. 32.

Barbary hen, its description, iii. 98.

Barble, a flat fish, its growth, iii. 297.

Barja, in South America, cattle destroyed at that place by the American bats, called vampyres, ii. 233.

Baris. See *Apes*, ii. 253.

Barnacle, imaginary, a shell fish, iv. 45.

Barometer, serviceable in measuring the height of mountains, i. 66; measures the weight of the air; in what manner, 123; no changes in the air without sensible alteration in the barometer, 124; when it marks a peculiar lightness in the air, no wonder that it foretels a storm, and why, 141.

Barretiere, a famous youth, considered as a prodigy of learning at the age of fourteen; slept regularly twelve hours in the twenty-four, i. 211.

Bass, a rocky island in the Firth of Forth. See *Birds*, iii. 200.

Bath, persons coming out of a warm bath several ounces heavier than they went in; warm bath of sea water a kind of relief to mariners, upon a failure of fresh water at sea, i. 98.

Bat, bats as big as rabbits, i. 163; by some reckoned among birds, 277; doubtful among naturalists whether beast or bird; now universally take place among quadrupeds, ii. 229; Pliny, Gesner, and Aldrovandus placed it among birds; scarce in any particular resembles the bird, except in the power of sustaining itself in the air; description of the common sort in England; its intestines and skeleton, in some measure resemble those of mankind; makes its first appearance early in summer, and begins its flight in the evening; is seen to skim along the surface of waters; feeds upon gnats, moths, and nocturnal insects of every kind, which it pursues open-mouthed; its flight laborious, irregular, and, if interrupted, not readily followed by a second elevation; usually taken when, striking against an object, it falls to the ground; even in the summer it sleeps the greatest part of the time; its retreat; continues in a torpid state during winter; is usually hanging by its hooked claws to the roofs of caves; unaffected by all change of weather; is destroyed particularly by the owl; the bat couples and brings forth in summer from two to five young at a time; the female has two nipples forward on the breast, as in the human kind, and this a motive for Linnæus to give it the title of a primas, to rank it in the same order with mankind; the female makes no nest for her young; when she begins to grow hungry, and finds a necessity of stirring abroad, she takes her little ones and sticks them by their hooks against the sides of her apartment, and there they immoveably cling, and patiently wait her return; less similitude to the race of birds than of quadrupeds; great labour in flying, soon fatigues, and tires it in less than a hour; its petty thefts upon the fat of bacon; long-ear bat; horse-shoe bat; rhinoceros bat; a large race of bats in the East and West Indies truly formidable; a dangerous enemy; when united in flocks they become dreadful; they are ate; the Negroes of the African coast will not eat them though starving; on the African coast they fly in such numbers, as to obscure the setting sun; the rousette, or great bat of Madagascar, is found along the coasts of Africa and Malabar, where it is often seen about the size of a large hen; destroys the ripe fruits, and sometimes settles upon animals, and man himself; destroys fowls and domestic animals, unless preserved with the utmost care, and often fasten upon the inhabitants, attack them in the face, and make terrible wounds; the ancients have taken their idea of harpies from these fierce and voracious creatures, equally deformed, greedy, uncleanly, and cruel; the bat called the American vampyre; its description by Ulloa; purport of his account confirmed by various travellers, who all agree that it has a faculty of drawing blood from persons sleeping, and destroying them before they awake; a strong difficulty remains how they make the wound; Ulloa and Buffon's opinions; suppose the animal endowed with a strong power of suction; and that without inflicting any wound, by continuing to draw, it enlarges the pores of the skin, so that the blood at length passes; they are one of the great pests of South America, ii. 229 to 233; found in the holes deserted by the wood-pecker, iii. 119.

To bay, said of a stag when he turns his head against the hounds, ii. 68.

Beagle. See *Hound*, ii. 131.

Beak, how that of animals is produced, i. 198.

Beam, by hunters meant that part which bears the antlers, ii. 67.

Beams, those of the sun shining upon the fire put it out, and why; darting directly upon us, without the medium of the air, would burn us up at once, or blind us with effulgence, i. 134.

Bears, in cold frozen regions of the North, not smaller than in milder countries, i. 163; the North American Indians anoint their skins with fat of bears, 249; the bears now and then make depredations upon the rein-deer, ii. 88; in Greenland do not change colour; three different kinds; the black of America does not reject animal food, as believed; places where they are found; retreat of the brown bear; a vulgar error, that, during winter, the brown bear lives by sucking its paws; it seems rather to exist upon the exuberance of its former flesh, iii. 11; the male and female do not inhabit the same den, and seldom are seen together, but upon the accesses of genial desire; care of the female for her young; the bear, when tamed, seems gentle and placid, yet still to be distrusted and managed with caution, being often treacherous and resentful without a cause; is capable of a degree of instruction; when come to maturity, can never be tamed; methods of taking them; their paws and hams a great delicacy; the white placed in the coldest climates, grows larger than in the temperate zones, and remains master of the icy mountains in Spitzbergen and Greenland; unable to retreat when attacked with fire-arms, they make a fierce and long resistance; they live upon fish and seals; their flesh is too strong for food; are often seen on ice-floats, several leagues at sea, though bad swimmers; the white sometimes jumps into a Greenlander's boat, and, if he does not overset it, sits down calmly, and like a passenger suffers itself to be rowed along; hunger makes it swim after fish; often a battle ensues between a bear and a morse, or a whale, and the latter generally proves victorious, 12 to 15.

Beards, Americans taking great pains to pluck theirs up by the roots, the under-part, and all but the whiskers, therefore supposed to have no hair growing on that part; Linnæus himself has fallen into this mistake; different customs of men, in the manner of wearing their beards, i. 196, 197.

Beasts, are more fierce and cruel in all countries, where men are most barbarous, i. 284.

Beasts of chase, in the reign of William Rufus, and Henry the First, it was less criminal to destroy one of the human species than a beast of chase; sacred edifices thrown down, and turned to waste, to make room for beasts of chase, ii. 66.

Beasts of prey seldom devour each other; they chiefly seek after the deer or the goat; their usual method of hunting, i. 280.

Beaver, known to build like an architect, and rule like a citizen, i. 283; its fore parts taste like flesh, and the hinder like the fish it feeds on, ii. 97; a remaining monument of brutal society; its qualities, taken from its fellows, and kept in solitude or domestic tameness; resists only when driven to extremity, and fights when its speed cannot avail; the only quadruped that has a flat broad tail, covered with scales, serving as a rudder to direct its motions in the water; the sole quadruped with membranes between the toes on the hind feet, and none on the fore feet; the only animal in its fore parts entirely resembling a quadruped, and its hinder parts approaching the nature of fishes, having a scaly tail; its description; has but one vent for the emission of excrements and urine; they assemble about the months of June and July; make a society to continue the greatest part of the year; form a company of above two hundred; fix their abode by the side of a lake or river; cut with their teeth a tree thicker than a man's body; amazing works and mansion-houses; convey their materials by water; mix clay and dry grass together, work it into a mortar, and with their tails plaster their work within and without; their walls perpendicular, and two feet thick; their piers fourscore or a hundred feet long, and ten or twelve feet thick at the base: their dykes ten and twelve feet thick at the foundation; their apartments round, or oval, and divided into three stories, one above the other; visited too often by men, they work only in the night-time, or abandon the place, and seek a safer situation; four hundred reside in one mansion-house, divided into a number of apartments, having communication with each other; their works in the northern parts finished in August or September; in summer they are epicures; their provisions for the winter season; they drive piles into the earth, to fence and fortify their habitation against the wind and water; cut down branches three to ten feet in length; the largest are conveyed to their magazines by a whole body; the smallest by one only; each taking a different way, and having a walk assigned him, that no one should interrupt another in his work; wood-yards larger or smaller, in proportion to the number in family; manner of catching them in snares or by surprise; they swim with their mortar on their tails, and their stakes between their teeth; their works damaged by force of water, or feet of huntsmen, instantly repaired, ii. 237 to 241.

Beauty, every country has peculiar ideas of beauty; extraordinary tastes for beauty, i. 188; every nation, how barbarous soever, has peculiar arts of heightening beauty; several of these arts, 189; a modern lady's face formed exactly like the Venus of Medicis, or the sleeping Vestal, would scarcely be considered as a beauty, except by the lovers of antiquity; less in the object than in the eye of the beholder; superior beauty of our ancestors not easily comparable, i. 259.

Beccafigo, a bird of the sparrow kind, iii. 141.

Bed, of a river, an increase of water there increases its rapidity, except in cases of inundation, and why; such bed left dry for some hours by a violent storm blowing directly against the stream, i. 86.

Beds, the earth every where in beds over beds, and each of them maintaining exactly the same thickness, 90.

Bee, a ruminating insect, or seemingly so; its stomach is composed of muscular fibres, ii. 28; operations, studied for two thousand years, are still incompletely known; Reaumur's account sufficiently wonderful; many of the facts held dubious by those conversant with the subject; some declared not to have existence in nature; three different kinds of bees; common working bees neither male nor female; queen bees lay all the eggs that are hatched in a season; structure of the working bee, particularly of its trunk, which extracts the honey from flowers; manner of building their cells; in one day, they make cells upon each other enough to contain three thousand bees; description of those cells; the combs made by insensible degrees, not at once as some imagine; the cells for the young and for the drones; that for the queen bee the largest of all; those for honey are deeper than the rest; that not the only food upon which they subsist; manner of anticipating the progress of vegetation; the bee has a stomach for wax as well as honey; bee-bread; treacle for food of bees in winter; what part of the flower has the honey; sting of the bee; any wanting food, bends down its trunk to the bee from whom it is expected, which then opens its honey-bag, and lets some drops fall into the other's mouth; numerous as the multitude of bees appear in a swarm, they all owe their origin to one parent, called the queen-bee: opening the body of a queen, the eggs at one time found to amount to five thousand: the queen easily distinguished from the rest; great fertility of the queen, and the great attention paid to her, controverted by recent observers; they leave a cell to every egg and destroy the rest; great care and affection for the young; in about twenty days after the egg was laid, the bee was completely formed, and fitted to undergo the fatigues of its state; the cell being prepared, the animal soon transformed into an aurelia different from that of the common caterpillar; when they begin to break their prisons, above a hundred are excluded in one day; dreadful battles often ensue between the young brood and the progenitors; signs previous to their migrations; after the migration, the queen being settled, the swarm follows, and in a quarter of an hour the whole body is at ease; sometimes sacrifice their queen, but never when the hive is full of wax and honey; the working sort kill the drones in the worm state, in the cell, and eject their bodies from the hive among the general carnage; upwards of forty thousand bees found in a single hive; instances of expedition in working; in the first fifteen days, they make more wax than during the rest of the year; a hive sending out several swarms in the year, the first always the best and most numerous; a kind of floating bee-house used in France, iv. 174 to 183.

Bees, in other countries; in Guadaloupe are less by half than in Europe, and have no sting; sometimes there are two or three queens to a swarm; then the weaker deserted for the more powerful protector; the deserted queen does not survive the defeat; is destroyed by the jealous rival; and till this be done, the bees never go out to work; at Guadaloupe their cells are in hollow trees, sometimes with a sort of waxen house, shaped like a pear, in which they lodge their honey and lay their eggs; their honey never congeals, is fluid as oil, and has the colour of amber; in the tropical climates are black bees without a sting; their wax is soft and only used for medicinal purposes, not being hard enough for candles as in Europe; whether the humble bees have a queen or not, there is one much larger than the rest, without wings, without hair, all over black, like polished ebony; this views all the works, from time to time; their habits; the honey gathered by the humble bees neither so fine, so good, nor the wax so clear, or so capable of fusion, as those of the common bees, iv. 182 to 185.

Bees, leaf-cutting, make their nest, and lay their eggs among bits of leaves, iv. 185.

Bees, wall, so called, because they make their nests in walls; the male and females are of a size: the former without a sting, iv. 185.

Bee, wood, iv. 184; *Bee, mason*, *Bee, ground*, builds its nest in the earth; the patience and assiduity of their labour, 185.

Beetles, a ruminating insect, or seems to ruminate, ii. 28; their general characteristics; their kinds distinguished from each other; description of the dor-beetle or the May-bug; how the two sexes in the May-bug are distinguished from each other; season of their coupling; the female bores a hole into the ground, where to deposit her burden; and when lightened of it ascends from the hole to live as before, their eggs; description of the insect, and of its manner of life in the worm state; continues in that state for more than three years, changing every year its skin; and living under the ground without eyes; in what manner it assumes the form of a chrysalis; time when it becomes winged, and completely formed; the old one never survives the season; and dies from the severity of cold in winter; its habits and food, when completely formed; number of their eggs; rooks and hogs particularly fond of them, and devour them in great numbers; instances of great devastations made by the May-bug; description and habits of that beetle which the Americans call the tumble-dung; the insect called the king of the beetles; description of the elephant-beetle; the largest of this kind hitherto known, iv. 199 to 201.

Beggars, a question in the schools, which the most happy man, the beggar by night, and king by day; or the beggar by day, and king by night, i. 212.

Belcher, (*Mr.*) See *Blood*, i. 233.

Bell, the great diving-bell improved by Dr. Halley; he could write or read in it when the sea was clear, and especially when the sun shone, i. 118.

Bell, when the stag cries, he is said to bell, ii. 67.

Bells, their vibrations not heard under the receiver of an air pump, i.

Belly, a minute description of the false belly of the opossum, ii. 270.

Berries, the Laplanders drink water, in which juniper-berries have been infused, i. 241.

Bewailer, or the sai, a monkey of the new continent, ii. 267.

Bezoar, German bezoar, ii. 52.

Bezoar-goat, the oriental bezoar, ii. 54; cow-bezoar, and monkey-bezoar, 54; hog bezoar, 54.

Billiting, a name given by the huntsmen to the excrement of the fox, ii. 148.

Birch, hares are particularly fond of it, ii. 179.

Birds all produced from the egg, i. 170; their lower eye-lid alone has motion, 192, have the neck longer than any other kind of animals; those which have short claws have also short necks; those that have long claws have the neck in proportion, 198; have a power of discharging food to feed their young; ruminating birds, ii. 28; many kinds which the dog will not touch, 139; hunters often informed by the birds of the place of retreat of the fox, 149; a flock of small birds often alarms every thicket, and directs the hunter to the martin, 165; surpass fishes and insects in the structure of body, and in sagacity; their anatomy and conformation; compared to a ship making way through water; are furnished with a gland behind, containing a proper quantity of oil; to what purpose; description of their feathers; the pectoral muscles of quadrupeds trifling to those of birds; choose to rise against the wind, and why; all except the nocturnal have the head smaller, and less in proportion to the body, than quadrupeds; their sight exceeds most other animals, and excels in strength and precision have no external ear standing out from the head; the feathers encompassing the ear-holes supply the defect of the exterior ear; the extreme delicacy of their sense of hearing is easily proved by their readiness in learning tunes, or repeating words, and the exactness of their pronunciation; their delicacy in the sense of smelling; instance of it in ducks; the tail guides their flight like a rudder, and assists them either in the ascent or decent; wonderful internal conformation; the wind-pipe often makes many convolutions within the body of the bird, and is then called the labyrinth; of what use these convolutions are, no naturalist has been able to account; this difference obtains in birds to all appearance of the same species; whence some derive that loud and various modulation in their warbling is not easily accounted for; birds have much louder voices in respect to their bulk than animals of other kinds; all have properly but one stomach, but different in different kinds; the organs of digestion in a manner reversed in birds; why they pick up sand, gravel, and other hard substances; most have two appendices or blind-guts; in quadrupeds always found single; all birds want a bladder for urine; their urine differs from that of other animals; effects of the annual moulting which birds suffer; their moulting-time artificially accelerated; and how; the manner in which Nature performs the operation of moulting; their moulting-season; many live with fidelity together for length of time; when one dies, the other shares the same fate soon after; the male of wild birds as happy in the young brood as the female; nothing exceeds their patience while hatching; Addison's observations to this purpose; great care and industry in providing subsistence for their young; they feed each of the young in turn, and why; perceiving their nests or young to have been handled, they abandon the place by night, and provide a more secure, though less commodious retreat; the young taught the art to provide for their subsistence; those hatched and sent out earliest in the season the most strong and vigorous, iii. 28 to 38; they endeavour to produce early in the spring, and why; efforts for a progeny when their nests are robbed; such as would have laid but two or three eggs, if their eggs be stolen, will lay ten or twelve; the greatest number remain in the districts where they have been bred; and are excited to migration only by fear, climate, or hunger; cause of the annual emigrations of birds; times of migrations; in what order performed; follow the weather rather than the country, and go on as they perceive the atmosphere more suitable to their wants and dispositions; in all countries, longer-lived than quadrupeds or insects of the same climate; surprising age of swans and geese; plumage and voice of birds in different zones; all less than quadrupeds; the greatest of one class surpass the greatest of the other in magnitude: causes of the great variety in the middle order of birds; the ostrich is the greatest of birds: the humming-bird the smallest: wild birds generally of the same magnitude and shape: inferior to quadrupeds in docility; the number already known above eight hundred; difference between land-birds and water-fowls; description of birds of the rapacious kind; the pie kind; the poultry kind; the sparrow-kind; the duck kind; the crane kind, 38 to 43; the cormorant the best fisher; the nauseous bird or dodo; powers of land-birds of the rapacious kind to obtain their food; sight of such as prey by day surprisingly quick; such as ravage by night have their sight fitted to see in darkness with precision; inhabit the most lonely places and desert mountains; appearing in cultivated plains, or the warbling groves, is for depredation; every order of carnivorous birds seek for those of the size approaching their own; the carnivorous kinds only breed annually, and are less fruitful than others; breed but few at a time; where supplies of food are difficult, the old soon drive the brood from the nest to shift for themselves, and often destroy them in a fury caused by hunger; almost all birds of prey unsociable; the male and female, when necessary to each other, live together; but they most usually prowl alone; birds with crooked beaks and talons are solitary; all males of prey are less and weaker than the females; the females are of a greater size, more beautiful and lovely for shape and colours, stronger, more fierce, and generous than the males; it may be necessary to be thus superior, to provide for herself and her young; these birds are lean and meagre; their flesh is stringy and ill-tasted, soon corrupting, and flavoured of that animal upon which they subsist; Belonius asserts, many people like the flesh of the vulture and falcon, and dress them for eating; and that the osprey, when young, is excellent food; five kinds of land-birds of a rapacious nature; whence their distinctive mark; bird of heaven, name given by the ancients to the eagle, 56 to 61; the most formidable birds of prey respect the butcher-bird, 76; the digestion of such as live upon mice, lizards, or the like food, not very perfect, 79; Father Kircher set the voice of birds to music, 80; domestic birds of the poultry kind, maintained in our yards, are of foreign extraction. 84; the wilder species, cooped or caged, pine away, grow gloomy, and soon refuse all sustenance; the poultry kind alone grow fat, 85; climate, food, and captivity, three very powerful agents in the alteration, in the habits, and the very form of birds; of all birds the cock the oldest companion of mankind, and the first reclaimed from the forest, 86; also the Persian bird of Aristophanes, 87; description of the tamis or the bird of Numidia, 98; the bustard the largest land-bird, native of Britain, 99; none secures its young better from external injury than the toucan, 117; God's bird, the bird of paradise, 122; the pigeon, for its size, has the largest crop, 132; paraquets the most beautiful in plumage, and the most talkative birds in nature, 130; small birds mark out a territory to themselves, which they permit none of their own species to remain in; at some seasons of the year, all small birds migrate from one country to another, or from more inland provinces towards the shore; months of their migrations; autumn the principal season for catching these wanderers; the nets, and the method of catching them; flur-birds; singing among birds, universally the prerogative of the male; small birds fight till one yields his life with the victory; two male birds strive in song till the loudest silences the other; during the contention, the female sits an attentive, silent auditor, and often rewards the loudest songster with her company during the season; the male, while his mate is hatching, sits upon some neighbouring tree, to watch and to sing; the nest of small birds warmer than of larger; small birds having finished their nests, nothing exceeds the cunning they employ to conceal it; worms and insects the first food of all birds of the sparrow kind; how birds of the sparrow kind bring forth and hatch their young; manner of life during the rigour of winter; the male of small birds not finding a mate of his own species, flies to one of another like him, left out in pairing; a mixed species between a goldfinch and a canary-bird, between a linnet and a lark; these breed frequently together, and produce not, like the mules among quadrupeds, a race incapable of breeding again, but one as fruitful as their parents; various birds of the sparrow kind; many plants propagated from the depositions of birds; many of those kinds, which are of passage in England, permanent in other countries; and some with us constant residents, in other kingdoms have the nature of birds of passage; instances of it, 137 to 144; the heron commits the greatest devastation in fresh waters, 171; the flamingo has the largest tongue, 179; birds of various sorts and sizes, more than the stars in a serene night, seen in the rock of the Bass and in the Frith of Forth, 200; none make a more indifferent figure upon land, or a more beautiful in the water than the swan, 215; of all birds known it is the longest in the shell, 217; an incontestible proof that birds have their manners rather from nature than education, 220.

Bird-catchers sport by counterfeiting the cry of the owl, iii. 81; nets for, and method of taking small birds, 138.

Bison and *Urus*, names of descendants of one common stock; error of the naturalists upon this point; the cow and bison are animals of the same kind: description of the bison; it is supposed by Klein and Buffon no more than another name for the bonassus; the breed found in all the southern parts of the world; that breed more expert and docile than ours; many bend their knees to take burdens up, or set them down; the respect for them in India degenerated into adoration; it is nimble of foot; is esteemed by the Hottentots; assists them in attending their flocks and guarding them against invaders; is taught to combat the enemies of the nation, and every army of the Hottentots is furnished with a herd of them; they procure the Hottentots an easy victory before they strike a blow; lives in the same cottage with its master, and when it dies, a new one is chosen to succeed it by a council of the old men of the village, and is then joined with a veteran of its own kind, from whom it learns, becomes social and diligent, and is taken for life into friendship and protection; the bisons are found to differ from each other in several parts of the world; some have horns, and some are without, they are equally tractable and gentle when tamed, and are furnished with a fine, lustrous, soft hair, more beautiful than that of our own breed; their hump of different sizes, weighing from forty to fifty pounds, more or less; cuts and tastes somewhat like a dressed udder; the bisons of Malabar, Abyssinia, Madagascar, Arabia, Asia, Africa, and America; in the course of a few generations, the hump wears away; its description; the bison and the cow breed among each other, the grunting, or Siberian cow, and the little African cow, or zebu, are different races of the bison, ii. 31 to 38.

Bitch, a pregnant bitch, so placed by Mr. Buffon, that her puppies were brought forth in warm water, i. 180; one forgotten in a country house lived forty days without any other nourishment than the wool of a quilt she had torn to pieces, ii. 139.

Bittern, or mire-drum, the solemnity of its evening-call cannot be described by words; they are calls to courtship or of connubial felicity; it differs from the heron chiefly in colour; its windpipe fitted for the sound; opinions concerning the cause of its boomings; never utters its call in domestic captivity; its residence; a retired, timorous animal: its food, nest, and eggs; in three days, leads its little ones to their food differences between the bittern and the heron; its hollow boom considered by the vulgar as the presage of some sad event; instance of it; its flesh greatly esteemed by the luxurious; it seldom rises but when almost trod upon; at the latter end of autumn, in the evening, its wonted indolence forsakes it; is then seen rising in a spiral ascent, till quite lost from the view, making a singular noise different from its former boomings; names given to this bird by the Greeks and Latins, iii. 174, 175.

Bivalve shells, iv. 27; all the kinds hermaphrodite, yet require no assistance towards impregnation, 37; particularly in those shell-fish the pearls are found, 41.

Blackbird, of the sparrow kind, iii. 141; sometimes seen all over white; its eggs and nest, 135.

Black-cap, bird of the sparrow kind, iii. 143; prized by some for its singing, and is also called the mock nightingale, 150.

Blacks, conjectural opinion that the blacks are a race of people bred from one man accidentally black, i. 247; the climate a cause obvious and sufficient to produce blackness; nothing satisfactory discovered upon the cause of producing it in human complexions; opinion of Sir Thomas Brown upon the subject, 248; whence originally their flat noses, 249; black parents have pro-created two white Negroes, 250.

Bladder, birds have no bladder for urine, iii. 33. See *Fishes*, iii. 237 to 239.

Blennius, or blenny, description of this fish, iii. 238 to 240.

Blind, such as live in countries generally covered with snow become blind, i. 220; the mole not blind, ii. 213.

Blindworm, its description, iv. 101.

Blood, arterial blood immediately mixed with air in the lungs, is of a fine florid scarlet colour; that of the veins returning to the heart, is of a blackish crimson hue; whence this difference of colour proceeds not well understood, i. 134; the blood circulates through the bones, as through every other part of the body; Mr. Belcher the first who discovered it: his experiment to this purpose, 233; blood of the rein-deer preserved in small casks for sauce with the marrow in spring, ii. 87; the heat of the blood in man and other animals above thirty degrees above congelation; in the marmot and other animals which sleep the winter, it is not above ten degrees, ii. 194.

Blue-bird described; its residence; is rarely caught; its docility; speaks and whistles at the word of command; manner of taking it, iii. 145, 146.

Blue Cat described, ii. 105.

Blushing, whence it proceeds, i. 195.

Boar, wild, varies not his colour as dogs of the domestic kind; description; he ploughs the ground like a furrow; his tusks seen almost a foot long; they differ from those of the elephant in that they never fail; when the boars come to a state of maturity, they dread no single creature; their position when attacked, ii. 90; the manner of hunting them; when killed, the testicles cut off to prevent their tainting the flesh, 90; was formerly a native of our country; William the Conqueror punished with the loss of their eyes such as killed it in his forests; at present the wild breed is extinct, 92; the Canary boar described; the tusks being broken away, the animal abates its fierceness and venery, and nearly the same effect as castration is produced, 99; does not fly at the approach of the lion; combat of a lion and a wild boar, in a meadow near Algiers, 110.

Boback, name of the marmot in Poland, ii. 195.

Bodies, why some light bodies swim, and ponderous bodies sink; the deeper a body sinks, the greater the resistance of the depressed fluid beneath; how then, after it has got a certain way, it does sink at all, i. 79, 80; animal bodies left to putrefy, produce air copiously, 136; symmetry of the human body; the body of a well-shaped man ought to be square, 191; human body often found to differ from itself in size; instance of it; the cause; differs also from itself in weight, 201; those parts furnished with the greatest quantity of nerves, are first in formation, 214; the tone of a sonorous body made to depend upon the number of its vibrations, and not the force, is taking an effect for a cause, 222; suffering is but to a certain degree; torture becoming excessive, destroys itself; and the mind ceases to perceive, when the body can no longer endure, 238.

Boerhaave, taxed with marking out to his pupils a little ridge of hills in Holland, as mountains of no small consideration, i. 60.

Boiguacu, the largest of the serpent kind in South America; sometimes forty feet in length, i. 162, 163; description of this creature, iv. 103.

Bonassus, supposed by Klein and Buffon another name for the bison, ii. 33.

Bones, in the embryo, almost as soft as the muscles and flesh, i. 233; hard as the bones seem, the blood holds its current through them, as through other parts of the body; in old age more solid, also more brittle, and why, 234; fossil bones found on the banks of the Ohio, in Peru and Brasil. ii. 263. See *Blood*, i. 203. See *Bread*, i. 241. See *Fish*, iii. 290.

Bonet-Chinois, Mr. Buffon's name of a monkey, supposed to be a variety of that called malbrouk, ii. 267.

Bonito, description of this fish, iii. 288.

Booby, name given by our seamen to birds of the penguin tribe, iii. 209.

Borandians, description of them, i. 240.

Boristhenes, or Nieper, a river, its course and source, i. 87.

Borneo, the natives hunt the ouran-outang in the same manner as the elephant or the lion, ii. 255.

Baroch, in the kingdom of Cambaya, flocks of peacocks seen in the fields near that city, iii. 92.

Bosphorus, (the Thracian) was the first appropriated, by granting to such as were in possession of its shore the right of fishing in it, i. 96.

Bottom of the sea in some parts not found, and why, i. 117; that of the Red Sea, a forest of submarine plants, 117; that of the sea near America covered with vegetables; a map of the bottom of the sea between Africa and America, by M. Buache, 118.

Borneo, island in the East Indies, were the babyroussa, or Indian hog, is principally found; hog of Borneo, the name given by travellers to the babyroussa, ii. 97.

Bowels of the ruminating animals considered as an elaboratory with vessels in it, ii. 27.

Boyuna, of Ceylon, a kind of serpent, iv. 102.

Brain and spinal marrow, the first seen in the embryo, i. 214; earth-worm entirely without it, iv. 211; some animals live without their brain for weeks, 212.

Brambling, a bird of the sparrow kind, iii. 142, 143.

Bramins of India have a power of smelling equal to most creatures; they smell the water they drink, though to us quite inodorous, i. 228.

Brasil, black clothes worn there soon turn of an iron-colour; kept in the shops, preserve their proper hue, 126, 127; duck described, iii. 221.

Bread, twelve ounces of it, and nothing but water, the common allowance, for four and twenty hours, among the primitive Christians of the East, i. 208, 209 that of the Laplanders composed of bones of fishes, pounded and mixed with the inside tender bark of the pine tree, i. 240.

Bream, description of the sea bream, iii. 286.

Breasts in women larger than in men; milk found in breasts of men as well as of women, i. 199; black women's breasts, after bearing one child, hang down below the navel; it is customary among them to suckle the child at their backs, throwing the breasts over the shoulder, i. 245.

Breath of the lion is very offensive, ii. 110; manner of breathing in fishes, iii. 235.

Breeze, constant breeze produced by the melting of snows, i. 39; from sea increases gradually till twelve, sinks away, and totally hushed at five; upon its ceasing, the land-breeze begins, increases till twelve at night, and is succeeded in the morning by the sea-breeze; cause of these two breezes; sometimes the sea and land breezes come at all hours; the and land sea breezes on the coast of Malabar and at Congo, i. 140. 141.

Brisson, his method of classing animals, i. 271.

Bristol, a citizen of it who ruminated his food, ii. 29.

Britons, the ancient, considered the hare as an unclean animal, and religiously abstained from it, ii. 183; the cock a forbidden food among them, iii. 87.

Broches, the horns of the stag the first year, ii. 67.

Brock, the stag of the third year, ii. 67.

Brown, (*Sir Thomas*,) hoped one day to produce children by the same method as trees, i. 170; his opinion upon the cause of blackness in human complexions, i. 248.

Brun, (*Le*) giving a painter directions about the passions, places the principal expression of the face in the eye-brows, i. 192.

Brush, the name given by huntsmen to the tail of the fox, ii. 148.

Brutes, in those countries where men are most barbarous and stupid, are most active and sagacious, ii. 266.

Bubalus, an animal partaking of the mixed natures of the cow, the goat, and the deer; its description; has often been called the Barbary cow, from which it differs widely, ii. 55.

Bubalus, properly a gazelle of Africa, ii. 80.

Bubalus of the ancients, supposed of the cow kind by Buffon, placed among the lower class of ruminant quadrupeds, ii. 33.

Buccinums, one or two of them viviparous, iv. 33.

Buck, capable of propagating at the age of one year; one buck sufficient for a hundred and fifty goats; becomes old before his seventh year, ii. 46· hunting the buck and the stag performed in the same manner in England, ii. 67; number of names invented by hunters for this animal; does not change his layer like the stag; manner of hunting him is much the same as that of stag hunting, ii. 73.

Buck-goat produces with the ewe an animal that, in two or three generations, returns to the sheep, retaining no marks of his ancient progenitor, ii. 39.

Buffalo, of the varieties of the cow kind, but two are really distinct, the cow and the buffalo; they bear antipathy to each other; they do not breed among each other, and no animals are more distinct and like each other less; are in abundance in Guinea and Malabar; it is a great swimmer; description of it; the veal of the young is not better eating than the beef of the old; they are natives of the warmer climates; yet are bred in several parts of Europe, particularly in Italy; the female produces one at a time; continues pregnant for twelve months; is afraid of fire; leather made of its hide is well known for thickness, softness, and impenetrability; guided by a ring thrust through the nose; milk of the female not so good as that of the cow: two buffaloes yoked draw more than four strong horses; its flesh hard and blackish, disagreeable to taste and smell; this animal wild in many parts of India, and dangerous; manner of hunting them; when tamed, no animal more patient or humble; inferior in size only to the elephant, the rhinoceros, or hippopotamos; the cameleopard, or camel, if taller, neither so long, nor so corpulent; is fond of the water, and crosses the largest rivers without difficulty; has an aversion to red colours that resemble flame; in those countries where they are in plenty no person dresses in scarlet; they make most use of their feet in combat, and rather tread their enemies to death than gore them, ii. 33 to 38.

Buffon, (*M.*) his theory of the earth, and a detail of, i. 21 to 23; questions that might be asked this most ingenious philosopher concerning his theory of the earth; he has brought together a multitude of facts relative to the history of the earth, 23; his systems about the rudiments of animals, 167; objections against it, 168; thinks that women never become bald, 192; his description of the first sensations of a man just brought into existence, pointing out the steps by which he arrived at reality, 230.

Buffoon-birds, name our sailors gave the Numidian crane; its peculiar gestures and contortions; the French call it demoiselle; it is a very scarce bird; the ancients have described a buffoon-bird, but not meant the Numidian crane, iii. 170.

Bug, the May-bug. See *Beetles*.

Bugs, their habits; described; are often found coupling tail to tail; manner of destroying them; they destroy fleas, and devour each other, iv. 122, 123.

Bulbous, hair is so at the root, i. 193.

Bulin, a sea-snail, performs the office of male and female at the same time, iv. 33.

Bull, the gimerro, asserted to be between the ass and the bull, ii. 21.

Bullfinch, bird of the sparrow kind, iii. 142, 143; may be taught to whistle to a regular tune, 153.

Bull-head, description of this fish, iii. 286.

Bulls, the wild, in Spain, mean, despicable animals, have nothing of that sternness of aspect remarkable in our bulls, ii. 33.

Bull's-eye, name given by sailors to a terrible hurricane: described, i. 144.

Bunting, bird of the sparrow kind, iii. 141.

Burnet, his theory of the earth; a detail of that work, i. 16, 17.

Bustard, the largest land-bird that is a native of Britain; inhabits the open and extensive plain; is much larger than the turkey, the male generally weighing from twenty-five to twenty-seven pounds; its description; places where frequently seen in flocks of fifty or more; its food; they have sentinels always placed at proper eminences, ever on the watch, to warn the flock of the appearance of danger; are often run down by greyhounds; in what manner; seldom wander above twenty or thirty miles from home; the males have a pouch, holding near seven quarts of water; they change their mates at the season of incubation, about the latter end of summer; separate in pairs, if there be a sufficiency of females for the males; otherwise the males fight until one of them falls; in France, some of those victims of gallantry found dead in the fields; their nests; they lay two eggs, almost of the size of a goose-egg; hatch in about five weeks; the young run about as soon as out of the shell; they assemble in flocks in October, and keep together till April; their food in winter; in parts of Switzerland they are found frozen in the fields in severe weather; when taken to a warm place, they again recover; usually live fifteen years, and are incapable of being propagated in a domestic state, iii. 99 to 101.

Butcher-bird, its description, with its habits; leads a life of continual combat; intrepidity of this little creature, in going to war with the pie, the crow, and the kestril, all above four times bigger than itself; it fights upon the defensive, and often comes to the attack with advantage, particularly when the male and female unite to protect their young, and to drive away the more powerful birds of rapine; in what manner they sally forth against them; sometimes the combat ends with the destruction of the assailant, and also of the defender; the most redoubtable birds of prey respect them, and they fly in their company without fearing their power or avoiding their resentment; small birds are its usual food; and when it has killed the bird, or insect, as asserted by the best authority, it fixes them upon some neighbouring thorn, and when thus spitted, pulls them to pieces with its bill; the smaller red butcher-bird migrates; the places where they are to be found; their nests, and the number of their eggs; the female feeds her young with caterpillars and other insects, but soon after accustoms them to flesh, procured by the male with great industry; their nature very different from other birds of prey in their parental care; for instead of driving out their young from the nest to shift for themselves, they keep them with care, and even when adult do not forsake them; the whole brood thus live in a family together; each family afterwards live apart, and build in concert; upon the returning season of courtship, this union is at an end, the family parts for ever, each to establish a little household of his own; their manner of flying is always up and down, seldom direct or sideways; different kinds of this bird, iii. 76, 77.

Butter, the fat of the manati serves in all cases instead of butter, ii. 248.

Butterfly, some kinds actually live upon little or nothing, one of the principal ornaments of oriental poetry; in those countries, the insect is larger and more beautiful than with us; easily distinguished from flies of every other kind by their wings; Linnæus has reckoned up above seven hundred and sixty different kinds, yet the catalogue is incomplete; number and beautiful colours of its wings; butterflies can discover their mates at more than a mile distance; description of the head, corselet, and body; the eyes have not all the same form; but the outward coat has a lustre, in which may be discovered all the colours of the rainbow; when examined closely, it has the appearance of a multiplying glass; the use of their horns, or feelers, as yet unknown; use of their trunks; difference between butterflies and moths; they often perceive the approach of the female at above two miles distance; by what sense is not easy to conceive; it has no organs for smelling; the female is larger than the male; if disturbed while united, the female flies off with the male on her back, entirely passive upon the occasion; after junction, they deposit their eggs and die; all females of this tribe are impregnated by the male by one aperture, and lay their eggs by another; every butterfly chooses for her brood, instead of the plant most grateful in its winged state, that which it has fed upon in its reptile form; how they keep their eggs warm, and also entirely concealed; many do not lay till the winter warns them of their approaching end; some continue the whole winter in hollows of trees, and do not provide for posterity until the beginning of April, then leave their retreats, deposit their eggs, and die, iv. 163 to 167. See *Aurelia*, iv. 160, 161.

Buttock, in man, different from that of all other animals, i. 199.

Buzzard, a sluggish, inactive bird; often remains perched whole days upon the same bough; lives more upon frogs, mice, and insects, than upon birds, more troublesome to seize; its manner of living in summer; so little capable of instruction, that it is a proverb to call one obstinately ignorant, a buzzard; the honey-buzzard, the moor-buzzard, and the hen-harrier, are of this stupid tribe, and differ chiefly in their size, iii. 75.

Byron, (*Commodore*) our last voyager that has seen the gigantic race of mankind. i. 258.

C.

Cabiai, the same animal as the capibara, ii. 96.

Cachalot, a fish said to pursue a shoal of herrings, and to swallow thousands at a gulp; iii. 235; it has generally gone under the name of the spermaceti whale, till Mr. Pennant made the distinction, borrowing its name from the French; seven distinctions in this tribe; description; the throat of this animal very formidable; with ease it could swallow an ox; it terrifies the dolphins and porpoises so much, as often to drive them on shore; it contains two precious drugs, spermaceti and ambergris; the oil of this fish is easily convertible into spermaceti, by boiling it with a ley of pot-ash, and hardening it in the manner of soap; candles are now made of it; the balls of ambergris not found in all fishes of this kind, but chiefly in the oldest and strongest, iii. 253, 254.

Cagui, or the saki, is the largest monkey of the sagoin kind; its description, ii. 268.

Cageta, a mountain near it, was split by an earthquake, i. 67.

Cairo, in what manner they produce there six or seven thousand chickens at a time, iii. 89.

Calao, the horned Indian raven, iii. 113.

Calcination, all animal substances when calcined are the same, iv. 61.

Calf, name given to the young of the hind, or the female of the stag, ii. 66.

Calf, or hind-calf; the stag called so the first year, ii. 67.

Callitrix, the green monkey of St. Jago, of the ancient continent; its description, ii. 267.

Callyonymus, the dragonet; description of this fish, iii. 285.

Calms attended with a deluge of rain; why, and where, i. 138.

Camblet, made of hair of animals about Angora, ii. 47.

Camel, a ruminating animal, ii. 28; camel and dromedary not two distinct kinds, only a variety of the same, which has subsisted time immemorial; the only sensible difference between those two races; they produce with each other, and the mixed breed is considered the best; of the two the dromedary is far the most numerous; countries where the camel and dromedary are found; neither can subsist, or propagate, in the climates towards the north; Arabia the most adapted to the support and production of this animal; the camel the most temperate of all animals; it can continue to travel days without drinking, and is often six or seven days without any sustenance; its feet formed to travel upon sand, and utterly unfit for moist or marshy places; many vain efforts tried to propagate the camel in Spain; they have been transported into America, but have multiplied in neither; they might perhaps produce in these countries, but would in a few years degenerate; their strength and their patience would forsake them; and instead of enriching, become a burden to their keepers; uses to which this animal is put among the Arabians; its education; it has a fifth stomach; has a reservoir, to hold a greater quantity of water than immediately wanted; when the camel finds itself pressed with thirst, it throws up a quantity of this water, by a simple contraction of the muscles, into the other stomachs; travellers, when straitened for water, have often killed their camels for what they expected to find within them; countries where commerce is carried on by means of camels, trading journeys in caravans; their food; pursue their way when the guides are utterly astray; its patience and docility when loaded; in what manner the female receives the male; one male left to wait on ten females, the rest castrated; they live from forty to fifty years; every part of this animal converted to some useful purpose; its very excrements are not useless; their burden; iii. to 5 to 9.

Cameleon, its dimensions and appetites; has a power of driving the air it breathes over every part of the body, iv. 76. changes of its colour; it is an error that it assumes the colour of the object it approaches; description of it by Le Bruyn, iv. 77; it often moves one eye, when the other is at rest; sometimes one eye seems to look directly forward, while the other looks backward; and one looks upward, while the other regards the earth, iv. 77.

Cameleopard, described; dimensions of a young one; inhabits the deserts of Africa; no animal, from its disposition or its formation, less fitted for a state of natural hostility: it lives entirely upon vegetables, and when grazing, spreads its fore-legs wide to reach the pasture; known to the ancients, but rarely seen in Europe; often seen tame at Grand Cairo, in Egypt; Pompey exhibited at one time ten upon the theatre, ii. 290, 291.

Camerarius, his description of the perfections a horse ought to possess, ii. 16.

Canada, above thirty thousand martins' skins annually imported from that country to England, ii. 165.

Canal. See *Blood*, i. 233. See *Fœtus*, iv. 43.

Canary-bird taught to pick up the letters of the alphabet at the word of command, to spell any person's name in company, iii. 42: by the name originally from the Canary Islands; comes to us from Germany; where they are bred in numbers; at what period brought into Europe is not known; about a century ago they were sold at very high prices, and kept only for the amusement of the great; in its native islands it is of a dusky gray colour, and so different from those seen in Europe, as to raise a doubt about its species; rules and instructions for breeding them in a domestic state; apparatus for breeding in Germany; food the old ones must be supplied with, when the young ones are excluded; so prolific are these bird sometimes, that the female will be ready to hatch a second time before the first is able to quit the nest; this bird kept in company with the linnet, or the gold-finch, pairs and produces a mixed breed, most like the canary-bird, and resembling it in its song, 151 to 153.

Canary-boar described, ii. 99.

Cancerous breasts cured by the sucking of the rubeth, or the land-toad, iv. 58.

Candle quickly extinguishes in an exhausted receiver, and why, i. 134.

Cannons, filled with water, and left to freeze, burst, i. 76.

Cantharides, well known in the shops by the name of Spanish flies, and for their use in blisters; their description, with the differences from each other; the countries where, and trees on which they are seen; it is reported, that the country people expect the return of these insects every seven years; their bad smell is a guide for those who catch them; they smell so disagreeable, as to be perceived at a great distance, especially about sun-set, though not seen at the time; they yield a deal of volatile caustic sal· their qualities; the effects fall principally upon the urinary passages; in what manner they are killed, iv. 202, 203.

Cape de Verde islands; a south wind prevails in them during the month of July. i. 146

Cape of Good Hope, a north-west wind blows there during the month of September, i. 139; at the Cape of Good Hope it is customary to hunt the elephant for its teeth; in what manner; account of an unhappy huntsman, ii. 283.

Capibara, or cabiai, an animal resembling a hog of about two years old; its description; some naturalists have called it the water-hog; and why; a native of South America, and chiefly frequenting the borders of lakes and rivers; like the other it seizes the fish, upon which it preys, with its hoofs and teeth; live also upon fruits, corn, and sugar-cane; its cry resembles the braying of an ass, more than the grunting of a hog; its only place of safety is the water, into which it plunges when pursued, and keeps so long at the bottom, that the hunter can have no hopes of taking it there; when young is easily tamed; its flesh has a fishy taste, but its head is said to be excellent, ii. 96, 97.

Capons, taught to clutch a fresh brood of chickens throughout the year, iii. 90.

Capon of Pharaoh, supposed the true ibis; is a devourer of serpents, and follows the caravans that go to Mecca, to feed upon the offal of the animals killed on the journey, iii. 168.

Caracal, or the siagush, a native of the East Indies, resembles the lynx in size, ii. 122.

Caracol, a town situated at the foot of the Andes, i. 63.

Caraguata, a plant in the West Indies which clings round the tree it happens to be near; it keeps away that nourishment designed to feed the trunk, and at last entirely destroys its supporter, i. 162.

Carapo, description of this fish, iii. 287.

Carassa, a volcano in South America, i. 45.

Caravan, a single lion of the desert often attacks an entire caravan. ii. 107; the assemblage called a caravan sometimes composed of numbers amounting to ten thousand, iii. 7.

Carcajou, name given by the North Americans to the glutton; its manner of killing the rein-deer, ii. 88.

Caribou, name the North Americans give the rein-deer, ii. 82.

Carli, (*Father.*) See *Monkey*, ii. 266.

Carnivorous animals, there is one class that pursue in a pack, and encourage each other by their mutual cries; support a state of famine for several weeks together, i. 281; milk in those animals is more sparing than in others, i. 286; See *Animals*, ii. 27, 28.

Carnivorous birds seek for such as are of the size most approaching their own, iii. 67. See *Birds*.

Carp, an experiment made with this fish in a large vase of water, under an air-pump, iii. 236; one found by Buffon not less than a hundred years old; this discovery confirmed by other authors, 238; continues in the egg not above three weeks, 239; Mr. Tull famous for his invention of spaying carp to give it a fine flavour, 240; its description, 288; the method of fattening it in a damp cellar; it has been known thus to live for a fortnight, to grow exceedingly fat, and to get a superior flavour, 290.

Carriers, pigeons used to carry letters, iii. 134.

Carrion-crow, resembles the raven in its appetites, its laying, and manner of bringing up its young, iii. 111.

Cartesius, his theory to explain the invariable motion of the winds, not quite so absurd as that of Dr. Lyster, i. 137.

Carthagena, in America; the heat of its climate affects the speech of its inhabitants, which is soft and slow, and their words generally broken; more than three parts of our army destroyed by the climate, in our unsuccessful attack upon it, i. 130.

Carthamus, or bastard-saffron, strongly purgative to man; parrots very fond of it, iii. 130.

Cartilage, the thyroid cartilage, i. 198, 199; cartilages in youth elastic, and pliant in age, become at last hard and bony, and why, 133.

Cartilaginous fishes; their general conformation; supposed they grow larger every day till they die; their internal structure; are possessed of a two-fold power of breathing; apertures by which they breathe; the cartilaginous shark, or ray, live some hours after they are taken; fishes of this tribe can remain under water, without taking breath: and can venture their heads above the deep, and continue for hours out of their native element; their season and manner of copulating; and of bringing forth; little difference between the viviparous and the oviparous kinds, in this class of fishes; five divisions of the cartilaginous fish, iii. 258 to 260.

Cassowary, a bird first brought into Europe by the Dutch from Java, in the East Indies, where only it is found; its description; the part which most distinguishes this animal is the head, which inspires some degree of terror; its internal parts described; it has the head of a warrior, the eye of a lion, the defence of a porcupine, and the swiftness of a courser; is not fierce in its natural character; how it defends itself; extraordinary manner of going; the Dutch assert that it can devour glass, iron, and stones, and can even live on burning coals, without the smallest fear, or the least injury; the largest of its eggs is fifteen inches round one way, and twelve the other; places where this animal is found; it has not multiplied in any considerable degree, as a king of Java made a present of one to the captain of a Dutch ship, as a rarity, iii. 52 to 54.

Catecombs of Egypt, i. 264.

Catamountain hunts for the hare or the rabbit, i. 280; the ocelot of Mr. Buffon; its description, ii. 121; is one of the fiercest, and, for its size, one of the most destructive animals in the world, 124.

Catanea, a city utterly overthrown by an earthquake, i. 50.

Cataphractus, or kabassou, is one of the largest kinds of the armadillo, ii. 226.

Cataracts of the Rhine, and of the Nile; the cataract of the river Velino, in Italy, is above a hundred and fifty feet perpendicular; a cataract near the city of Gottenburg in Sweden; other cataracts, i. 92.

Cataract of the eye, Mr. Cheselden having couched a boy of thirteen, who to that time had been blind, and at once having restored him to sight, curiously marked the progress of his mind upon the occasion, i. 217.

Caterpillars, their differences from all other insects; all these animals are hatched from the eggs of butterflies; during winter, the greatest number of caterpillars are in an egg state; in the aurelia state, they are seemingly deprived of life and motion; some do not make any change at the approach of winter, but choose themselves some retreat, and there remain quite motionless, and as insensible as if actually dead; caterpillars of this kind are found in great numbers together, inclosed in one common web that covers them all; there are some of the kind, whose butterflies live all the winter, and where; a single caterpillar eats double its own weight of leaves in a day, and seems no way disordered by the meal; the body of the caterpillar anatomically considered; avidity with which they feed; number of their stigmata, or those holes through which the animal is supposed to breathe; it has eighteen lungs; the experiment of Malpighi to ascertain their use; all caterpillars spin at one time or another; many of them change their skins five or six times in a season; and in what manner; change into an aurelia; their retreats in that state, iv. 153 to 160; there are thousands of fishes, birds, and insects, that live chiefly upon caterpillars; a single sparrow and its mate, that have young ones, destroy above three thousand caterpillars in a week; some of the kind, fitted only to live upon leaves and plants, will eat each other, in preference to their vegetable food; the bodies of the larger kinds serve as a nest to various flies, that very carefully deposit their eggs in them; number of worms remain within the body of the caterpillar, devouring its entrails without destroying its life; the ichneumon tribe is not the caterpillar's offspring, as supposed, but its murderers, 167 to 169.

Cat-fish, its description, iii. 285.

Cats, the wild hunt for the squirrel or the mouse, i. 280; the whole tribe seek their food alone, and never unite for mutual support; and, except at certain seasons, are enemies to each other; all of the cat kind devour nothing but flesh; and starve upon any other provision; their greatest force lies in the claws; the cat goes with young fifty-six days, and seldom brings forth above five or six at a time; the male often devours the kittens; before they are a year old they are fit to engender; the female seeks the male with cries; nor is their copulation performed without great pain, and why; cats hunt the serpents in the Isle of Cyprus; any animal weaker than themselves, is to them an indiscriminate object of destruction; the mouse is their favourite game, and they patiently watch a whole day until the mouse appears; a flagrant mark by which the cat discovers its natural malignity; their eyes see better in darkness than light; and why; if the inhabitant quits the house, the cat still remains; is excessively fond of some plants, such as valerian, marum, and catmint; particularly loves fish; its sleep is very light; its hair sends forth shining sparks, if rubbed in the dark; the wild breed with the tame; description of the wild cat; inhabits the most mountainous and woody parts; lives mostly in trees, and feeds only by night; the cat was much higher in esteem among our ancestors than it is at present; laws of Howel concerning the price of cats; cats were not naturally bred in our forests; of all quadrupeds, the wild cat is, perhaps, that whose intestines are proportionably the smallest and the shortest, and why; common to the new continent as well as the old; the blue-cat, the lion-cat, or more properly the cat of Angora; the cats in Syria and Persia remarkable for their long, soft hair, ii. 190 to 105; all the cat kind are kept off by the fires which the inhabitants light to preserve their herds and flocks; and they hunt rather by the sight than the smell; it happens that the lion pursues the jackall, or the wild dog, while they are hunting upon the scent, and merely for themselves; the lion is then an unwelcome intruder upon the fruits of their toil; from thence, probably, has arisen the story of the lion's provider, 109; the lion devours a great deal at a time, and generally fills himself for two or three days to come; in the deserts and forests, his most usual prey are the gazelles, and the monkeys, 110; the race of cats noxious in proportion to their power to do mischief inhabit the most torrid latitudes of India, Africa, and America, and have never been able to multiply beyond the torrid zone, 122; they seldom attack man, though provoked; of all animals these are the most sullen, and, to a proverb, untameable, 123; different classes of the kind from the lion to the cat, 125; the wild cat and the martin seldom meet without a combat; it is not a match for the martin, 163; the cat of Pharaoh injudiciously called the ichneumon, 166; cats of Constantinople, a name of the genet, and why, 170.

Cattle, we have the best breed of horned cattle in Europe, ii. 31; the large hornless breed in some parts of England, originally from Poland, ii. 31; the Dutch bring great quantities of lean cattle from Denmark to fatten on their own rich grounds; that of Ukraine becomes fat, and is considered the largest breed of all Europe; in Switzerland these animals grow to a large size; not so in France; size in Barbary, Ethiopia, Persia, and Tartary, 33; leather-mouthed cattle, 43; liable to be destroyed by the South American bat, vampyre, ii. 233.

Caverns, the amazing cavern of Eldenhole in Derbyshire; the dreadful cavern in the country of the Arrian Indians, called the Gulf of Pluto, described by Ælian; cavern of Maestricht; its description; no part of the world has a greater number of artificial caverns than Spain; in general deserted by every race of meaner animals, except the bat; the caverns called Oakley-hole, the Devil's-hole, and Penpark-hole, in England; the cavern of Antiparos, and its discovery; how natural caverns formed; two hundred feet as much as the lowest of them is found to sink, i. 31, 32; one in Africa, near Fez, continually sends forth smoke or flames, 45.

Cavier, the inhabitants of Norway prepare from eggs, found in the body of the porpoise, a savoury liquor, which makes a delicate sauce, and is good when eaten with bread, iii. 257; it is made with the roe of the sturgeon; more in request in other countries of Europe than with us; and is a considerable merchandise among the Turks, Greeks, and Venetians; manner of making it, iii. 276.

Causes, the investigation of final causes a barren study; and, like a virgin dedicated to the Deity, brings forth nothing, i. 16.

Caustic, cantharides yield a great deal of volatile caustic salt, iv. 202.

Cayman, a sort of crocodile, iv. 65.

Cayopolin, a kind of opossum; its description, ii. 272.

Cea, an island washed away with several thousand inhabitants, i. 58.

Cells, made by the bees, iv. 177.

Cencre, a mount of recent appearance, i. 69.

Centinel. See *Animals*, i. 281. See *Marmots*, ii. 194. See *Bustard*, iii. 99.

Centipes, the scolopendra, iv. 129.

Centricus, a kind of cartilaginous fish, iii. 286.

Cephus, name given by the ancients to the monkey now called mona, ii. 55.

Cepola, the description of this fish, ii. 281.

Cerigo, an island of the Archipelago, where many wild asses are found, ii. 18.

Cetaceous fishes, the whale and its varieties resemble quadrupeds in their internal structure, and in some of their appetites and affections; they are constrained every two or three minutes to come up to the surface to take breath, as well as to spout out through their nostril (for they have but one) that water which they sucked in while gaping for their prey; the senses of these animals superior to those of other fishes; and it is most likely that all animals of the kind can hear; they never produce above one young, or two at the most; and this the female suckles in the manner of quadrupeds, her breasts being placed, as in the human kind, above the navel; distinctive marks of this tribe, iii. 241 to 243.

Chacrelas, white men go by that name in the East Indies, i. 250.

Chætodon. See *Cat-fish*, iii. 285.

Chaffinch, a bird of the sparrow kind, iii. 142, 143; time of emigration of the hen. 30

Chapotonadas, a distemper in America, i 130.

Charles XII. when shot at the siege of Frederickshaldt, was seen to clap his hand on the hilt of his sword, i. 238.

Charossi, the only sort of horses for hunting lions, ii. 110.

Charybdis, a gulf; Nichola Pesce jumped into it, continued for three quarters of an hour below, and at last appeared holding a golden cup in one hand, and making his way among the waves with the other; description of this gulf, i. 120. 121.

Chase, men of every age and nation have made that of the stag a favourite pursuit; in our country it was ever esteemed a principal diversion of the great, ii. 66; these sports reserved by sovereigns for particular amusement, and when, in the reigns of William Rufus and Henry the First, it was less criminal to destroy a human being than a beast of chase, ii. 66; chase of the stag, as performed in England; terms used by hunters in that chase, 67, 68; the same in Sicily; and in China, 70; chase of the fox; cant terms used by the huntsmen in it, 148, 149; of all varieties, that of the ostrich the most laborious, is also the most entertaining; description of it, iii. 49.

Chasms, amazing in the Alps, and still more in the Andes, i. 30; causes that produce chasms or fissures, 31.

Chatterer, a bird, native of Germany; its description, iii. 115, 116.

Cheese, the inhabitants of Canada use no other than the milk of the hind, or the female of the stag, ii. 71; those of Lapland little and well tasted; never breed mites, ii. 86.

Cheops, the oldest measure of the human figure in his monument, in the first pyramid of Egypt, i. 259.

Cheselden. See *Cataract*, i. 217 to 219.

Chevrotin, or little Guinea-Deer, the least of all cloven-footed quadrupeds, and perhaps the most beautiful; is most delicately shaped; its description; native of India, Guinea, and the warm climates between the tropics; the male in Guinea has horns, but the female is without any; they chiefly abound in Java and Ceylon, ii. 56, 57.

Cheney, suspected the quantity of water on the earth daily decreasing, i. 77.

Chicken, an amazing history of it in the egg, by Malpighi and Haller, i. 170; in what manner six or seven thousand are produced at a time, at Grand Cairo; capons clutch a fresh brood of chickens throughout the year, iii. 90.

Child, history of the child in the womb, i. 175 to 179; children of Negroes able to walk at two months old, at least to move from one place to another, 181; skin of children newly brought forth, is always red, and why; the size of a new-born infant about twenty inches, and its weight twelve pounds, 181; in cold countries continue to be suckled for four or five years together, 182; child's growth less every year till the time of puberty, when it seems to start up of a sudden, 183; in some countries speak sooner than in others, and why; children of the Italians speak sooner than those of the Germans; various methods pointed out to improve the intellects of children, 184; white children frequently produced from black parents; but never black children from two whites, 250; inherit the accidental deformities of their parents; instances of it, 249; many instances of the child in the womb being marked by the strong affections of the mother; how performed is not known; hard to conceive that the child in the womb should take the print of the father's features, 253.

Chimboraso, a remarkable mountain in South America, i. 133.

Chinese, have neither flats nor sharps in their music, i. 222; their horses weak, little, ill shaped, and cowardly, ii. 13; description of that people, 246, 247.

Chorasan, in Persia, bodies previously embalmed, and buried in the sands of that country, preserved from corruption a thousand years, i. 263.

Chough, description of the Cornish Chough, iii. 111.

Christopher, (*St.*) See *Fish*, iii. 111.

Chrysalis, or the *aurelia*, iv. 159.

Chryses, an island sunk near Lemnos, i. 58.

Cicero, a long poem of his in praise of the halcyon, of which but two lines remain. iii. 226.

Circassians described, i. 246.

Circe, an enchantress, armed her son with a spear headed with the spine of the trygon, iii. 268.

Circulation of the blood. See *Blood*. i. 233, 234.

Civet, the species distinguished into two kinds; Mr. Buffon calls one the civet, the other the zibet; distinctions between the two kinds; the civet thirty inches long; both civet and zibet considered as varieties of the same animal, as former naturalists have done; the civet resembles the weasel kind, in what; differs from them in what; the opening of the pouch or bag, the receptacle of the civet; manner of taking the civet from the pouch; although a native of the warmest climates, this animal lives in temperate and even cold countries; kinds of food it likes best; drinks rarely, yet makes urine often; and, upon such occasions, the male is not distinguishable from the female; numbers of these animals bred in Holland, and the perfume of Amsterdam reckoned the purest of any; the quantity greater, proportionably to the quality and abundance of the food; this perfume so strong that it communicates to all parts of the animal's body; to its fur and skin; manner of choosing the perfume; the place of considerable traffic in it; the animal irritated, its scent becomes greater; and tormented, its sweat is still stronger, and serves to adulterate or increase what is otherwise obtained from it; civet a more grateful perfume than musk; sold in Holland for fifty shillings an ounce; its eyes shine in the night; sees better in the dark than by day; breeds very fast in climates where heat conduces to propagation; though a wild, fierce animal, never thoroughly familiar; lives by prey; birds and animals it can overcome; its claws feeble and inflexible; this perfume quite discontinued in prescription, ii. 170 to 172.

Clavicles, or collar-bones, what animals have them; Mr. Buffon says none but monkeys, but this is an oversight. i. 198.

Claws of the lion give a false idea of its power; we ascribe to its force the effects of its arms, i. 202; the weasel kind neither draw in, nor extend their claws, as cats do. ii. 155; those of the civet feeble and inflexible, 172.

Climates, calamities in those where the air is condensed by cold, i. 131; cause obvious and sufficient to produce blackness of Negroes, 248; complexions of different countries darken in proportion to the heat of the region; next to human influence, the climate has the strongest effects upon the nature and form of quadrupeds, 282; those excessively hot, unfavourable to horses, ii. 13; in general, water-fowls of no particular climate, iii. 212.

Cloth now made, worse than some years past; Flemings possessed the art of cloth-working in a superior degree, ii. 42.

Clove-trees cut down by the Dutch at Ternate to raise the price of the spice; soon had reason to repent of their avarice, i. 131.

Clouds the fore-runners of a terrible hurricane, called by the sailors the bull's eye, i. 144; dashing against each other produce electrical fire; water evaporates, and rising, forms clouds; the theory upon it; that of Dr. Hamilton; the author's theory of evaporation, 147, 148; at once pour down their contents and produce a deluge; reflecting back images of things on earth, like mirrors, 217.

Clupea, or *herring*, its descriptions, iii. 288.

Coaiti, a monkey of the new continent, described, ii. 267.

Coan, the name of a dwarf lately dead at Chelsea, i. 255.

Coast of Italy is bordered with rocks of marble of different kinds; those of France, from Brest to Bourdeaux, and Spain, composed of rocks, i. 110, 111; of the sea, have peculiar winds, 139; deadly winds all along those of the Persian Gulf, and those of India, 143.

Coatimondi, extreme length of its snout; its description; very subject to eat its own tail; its habits, iii. 18, 19.

Cobitis, the loach, description of this fish, iii. 288.

Cobra di Capello, a kind of serpent, iv. 91. 97. 99.

Cochineal, a description of this insect, as in our shops brought from America, difference between the domestic and the wild cochineal; precautions used by those who take care of these insects; the propagator has a new harvest thrice a year; various methods of killing them; produce different colours as brought to us; our cochineal is only the females, used both for dyeing and medicine, iv. 203, 204.

Cock, of all birds the cock the oldest companion of man, and first reclaimed from the forest; species of cock from Japan, covered over with hair instead of feathers; the western world had the cock from Persia; Aristophanes' cock the Persian bird; it was one of the forbidden foods among the ancient Britons; Persia that first introduced it to us, no longer knows it in its natural form; countries where it is wild; peculiarities, in a wild condition; another peculiarity in those of the Indian woods; their bones, when boiled, are as black as ebony; the Athenians had cock-matches as we; no animal of greater courage, when opposed to one of his own species; in China, India, the Phillippine islands, and over the East, cock-fighting the sport and amusement of kings and princes; cocks in China as bold, or bolder, than ours; and of more strength with less weight; its great courage proceeds from being the most salacious of all birds; a single cock suffices for a dozen hens; and is the only animal whose spirits are not abated by indulgence; soon grows old, and in three or four years becomes unfit for the purposes of impregnation; how long cocks live, left to themselves, not well ascertained; Aldrovandus makes their age to be ten years, are injured, as Linnæus asserts by elder berries, iii. 86 to 90; the black chiefly found in heathy mountains and piny forests, 100; cock of the wood, see *Woodcock*.

Cockle, a bivalved shell-fish, iv. 40.

Cocoa, the elephant eats the plants to the roots, ii. 276.

Cod, from the banks of Newfoundland, pursues the whiting, which flies before it to the southern shores of Spain, iii. 234; spawns in one season, as Lewenhoeck asserts, have nine millions of eggs or peas, contained in a single roe, 238; its description, 287; fishery in Newfoundland, 292.

Cold promotes evaporation, although diminishing the force of menstruums, i. 148; extremity of it not less productive of tawny complexions than that of heat, 248; excessive, preserves bodies from corruption, 262; some fishes rendered so torpid by cold in northern rivers, as to be frozen up in masses of ice, where they continue for months together, without life or sensation, prisoners of congelation, waiting a warmer sun to restore them to life and liberty, iii. 300.

Collar-bones, what animals have them, i. 198.

Colliers, eight dropped down dead by the vapour of the mines in Scotland, as if shot, i. 38.

Colour, none refreshes the sight so well as green, i. 14; of the sea, not from any thing floating in it, but from different reflections of rays of light; the proof, 50; different colours of the eye, 191; whence proceeds the tawny of the North American Indians, 248, 249; different of the waters of the same sea, 111; hair takes its colour from juices flowing through it, 192; that of the object contributes to form an idea of the distance at which it appears, 218; of all those by which mankind is diversified, ours most beautiful to the eye, and most advantageous, 247; those changes the African, the Asiatic, or the American undergo in their colour, are but accidental deformities, which might probably be removed, 251; nothing exceeds the delicate regularity of those of the zebra, ii. 22; change of colour in the hair obtains, in some degree, in all quadrupeds, 20; different in several parts of the fur of the sable, 165.

Comets, their number much greater than that of the planets; they roll in orbits; experience has not sufficiently confirmed the truth of the investigation about their returning periods, i. 10.

Complexion, extremity of cold not less productive of a tawny than that of heat; not easy to conceive how the sun whitens wax and linen, and darkens the human complexion; the sun not the only cause of darkening it, i. 248, 249.

Compte's (*Le*) account of an ape he saw in the straits of Molucca, ii. 253.

Concretions, scarce an animal, or a part of their bodies, in which concretions are not formed; experience has found but few cures by the efficacy of these concretions; often prove fatal to the animal that bears them, ii. 54.

Condamine (*La*) knows a fish possessed of the powers of the torpedo, and every way resembling a lamprey, iii. 272.

Condomar, anomalous animal of the goat kind; its description, ii. 56.

Condor, possesses in a higher degree than the eagle, all the qualities that render it formidable to the feathered kind, to beasts, and to man himself; is eighteen feet across the wings extended, according to Acosta, Garcilasso, and Desmarchais; the beak so strong as to pierce the body of a cow; two of them able to devour it; they do not abstain from man himself; fortunately there are few of the species; the Indians believe that they will carry off a deer, or a young calf in their talons, as eagles would a hare or a rabbit; and that their sight is piercing, and their air terrible; that they seldom frequent the forests, as they require a large space for the display of their wings; they come down to the sea-shore at certain seasons; when their prey fails upon land, they then feed upon dead fish, and such nutritious substances as are thrown upon the shore; their countenances not so terrible as old writers have represented; those who have seen this animal, say the body is as large as that of a sheep; many instances of its carrying away children; circumstantial account of this bird by P. Feuillée, the only traveller who has accurately described it; countries where it is found; in the deserts of Pachomac, where it is chiefly, men seldom venture to travel; its flesh as disagreeable as carrion, iii. 65, 66.

Conepate, an animal resembling the skink in all things except size, ii. 168.

Cougar of America, resembles the tiger in natural ferocity, though far inferior in its dimensions, iii. 16.

Congelation. See *Blood*, iii. 209.

Congo, the land and sea breezes there, i. 141; the inhabitants of that country desire ardently to prostitute their wives and daughters to strangers for trifling advantages, 186.

Constantinople, its cats; name given to the genets, and why ii. 170.

Continent of America; that part under the line is cool and pleasant, i. 247

Coot, description of that bird, iii. 187; residence and nest; sometimes swims down the current, till it reaches the sea; dangers encountered in this voyage, 188.

Copel, manner of making that vessel, i. 71.

Copulation, natural instinct for the proper times; instances of it, i. 286: gnats produce young without copulation, iv. 207.

Coquallin, the Brazilian squirrel, so called by Buffon, ii. 188.

Coral, the common red never met with in the fossil world, i. 26.

Coral-serpent, described, iv. 99.

Coral-plants, their various appearances; opinion of Count Marsigli upon corals; Mr. Ellis proves it the work of reptiles of the polypus kind; principal experiment to this purpose, iv. 221.

Coraline, called *fungi modrepores*, iv. 222.

Cordyle, the tockay, and the tejuguacu fill up the chasm between the crocodile and the African iguana, iv. 75.

Coret, a sea-snail, performs the office of male and female at the same time, iv. 36.

Coriander used in dressing a hare in the true Roman taste, ii. 182.

Corin, name of the third variety of gazelles, by Mr. Buffon, ii. 53.

Cormorant, its description and food; remarkably voracious, with a sudden digestion; its form disagreeable; its voice hoarse and croaking; all its qualities obscene; no wonder Milton makes Satan personate this bird; objection against this passage of Milton's Paradise Lost vindicated; fishes in fresh water, and in the depth of the ocean; builds in cliffs of rocks, and in trees; preys in the day-time, and by night; once used in England for fishing, and in what manner; how educated in China, for the purposes of fishing; the best fisher of all birds; sometimes has caught the fish by the tail; the fins prevent its being swallowed in that position; how it manages the fish in this case, iii 197 to 199; remarked for the quickness of its sight, 201.

Corn, the flying squirrel is apt to do a great deal of damage in the corn-fields, ii. 191.

Cornaro, lived a hundred years with a constitution naturally feeble, i. 235.

Cornea, of a flea. See *Flea* and *Flies*, iv. 165.

Cornwall, pilchards make that coast a place of resort, iii. 295.

Coromandel, dreadful tempests wholly unknown along its coasts, i. 139; amazing size of oysters along that coast, iv. 46.

Corrira, or the runner, a bird of the crane kind; its description, iii. 181.

Corruption, excessive cold preserve bodies from it; and a great degree of dryness produced by heat; earth, if drying and astringent, produces the same effect; bodies never corrupt at Spitzbergen, though buried for thirty years; men and animals buried in the sands of Arabia, preserved from corruption for ages, as if actually embalmed; bodies buried in the monastery of the Cordeliers at Thoulouse, preserved from corruption; bodies previously embalmed buried in the sands of Chorosan, in Persia, preserved from corruption for a thousand years; amazing preservation from it, in a mummy lately dug up in France, i. 262 to 266.

Coryphana, the razor-fish, its description, iii. 285.

Cotopaxi, volcano in South America, described by Ulloa, i. 45; more than three geographical miles above the surface of the sea, 65.

Cotton-tree, the seed intoxicates parrots, as wine does man, iii. 130.

Cottus, the bull-head; description of this fish, iii. 286.

Couando, much less than the porcupine, its description, ii. 221.

Cougar, the red tiger, by Mr. Buffon, ii. 117; extremely common in South America; in what manner the Indians encounter it, 118.

Coulterneb, remarkable bird of the Penguin kind. See *Puffin*, iii. 210.

Cows, allured by music, i. 123; of ruminant animals, the cow kind deserves the first rank; meanest peasants in Germany, Poland, and Switzerland, kill one cow at least for their own table; salted and hung up, is preserved as a delicacy the year round; cows want the upper fore-teeth; in no part of Europe cows grow so large, yield more milk, or more readily fatten than in England; make no particular distinction in their herbage, indiscriminately devouring the proper quantity; it gives back more than it takes from the soil; the age of the cow known by the teeth and horns; the number of its teeth; have eight cutting teeth in the lower jaw; manner of renewing them the horns more surely determine this animal's age, and how; while this animal lives, the horns lengthen; wants in udder what it has in neck; the larger the dew-lap, the smaller the quantity of its milk; the kind to be found in every part of the world: larger in proportion to the richness of the pasture; Africa remarkable for the largest and smallest cattle of this kind; as also India, Poland, and Switzerland; among the Eluth Tartars, the cow so large, that a tall man only can reach the tip of its shoulder, of all quadrupeds, the cow most liable to alteration from its pasture; the breed of the Isle of Man, and most parts of Scotland, much less than in England, also differently shaped; the breed improved by foreign mixture adapted to supply the imperfections of our own; such as purely British, far inferior in size to those of the Continent; the cow, the urus, and the bison, animals of the same kind; difference in size not so remarkable as those in its form, hair, and horns; many considered as a different kind, and names given them as a distinct species, when in reality all the same; only two varieties of the kind really distinct, the cow and the buffalo; they bear an antipathy to each other; scarce a part of the world where the cow kind is not found; variety of the horns; those in Iceland, are without horns; the Barbary cow, or zebu; of all animals, the cow most extensively propagated; an inhabitant of the frozen fields of Iceland, and the burning deserts of Lybia; other animals preserve their nature or their form with inflexible perseverance; the cows suit themselves to the appetites and conveniences of mankind; no animal has a greater variety of kinds, none more humble and pliant; the cow and bison breed among each other; the cow does not breed with the buffalo; no animals more distinct, or have stronger antipathies to each other; the cow goes nine months with young; the grunting, or Siberian cow, and the little African, or zebu, are different races of the bison; animals of the cow kind, by naturalists extended to eight or ten sorts, reduced to two; an animal of the cow kind, no naturalist has described; the description of it, ii. 29 to 39; the Greeks compared the eyes of a beautiful woman to those of a cow, 53; it eats two hundred and seventy-six plants, and rejects two hundred and eighteen, 84.

Cow-besuar, a factitious sort, ii. 54.

Crab, a ruminating fish, ii. 28; surprising manner in which the monkeys draw crabs from the water, 264; found in fresh and salt water, and upon land; description; its intestines have many convolutions; land-crabs of various kinds; some healthful and nourishing; others poisonous or malignant to a great degree; places where found, iv. 10.

Crab (*violet*) of the Caribbee islands described; their food; their nippers their principal instruments for seizing and cutting their food; catch such hold, that the limb is lost sooner than the grasp; thus it gets off, leaving its claw fastened upon the enemy; the claw performs its duty, and keeps a minute fastened upon the finger, while the crab makes off; it loses no great matter by a leg or an arm; as they grow again, the animal becomes perfect as before; fatiguing and amazing march from the mountains to the sea shore, to deposit the spawn, from which, soon after, millions of little crabs are seen slowly travelling up the mountains; wait the benefit of sea-water for their delivery; change their shells; have under their stomachs four white stones, which gradually decrease, as the shell hardens, and when come to perfection, are not to be found; season and manner in which they are caught; in Jamaica they are in great plenty, and considered as one of the greatest delicacies; many of this kind found poisonous, iv. 10 to 13.

Crab (*soldier*,) seen every year descending the mountains to the sea-shore, to deposit its spawn, and to provide itself with a new shell; contest between them for some well looking favourite shell, for which they are rivals; strike with their claws; beat each other, till the weakest is obliged to yield and give up the object of dispute; when taken, sends forth a feeble cry, endeavouring to seize the enemy with its nippers; not much esteemed for its flesh, iv. 13.

Crane, bred familiarly in our marshes formerly; not now, and why, iii. 39; general characteristics and habits of birds of the crane-kind; their food and flesh; description of the crane; Gesner says, its feathers in his time, were set in gold, and worn as ornaments in caps; description of this bird from ancient writers, who have mixed imagination with history; whence have arisen the fables of supporting their aged parents, and fighting with pigmies; the crane a social bird, and seldom seen alone: usual method of flying or sitting, in flocks of fifty or sixty together; while part feed, the rest keep guard; subsist mostly upon vegetables; are known in every country of Europe, except our own; are birds of passage; seasons of their migrations, during which they do incredible damage, chiefly in the night; were formerly known, and held in great estimation here for the delicacy of their flesh; there was a penalty upon destroying their eggs; Plutarch says, cranes were blinded, kept in coops, and fattened for the tables of the great in Rome; at present, they are considered all over Europe as wretched eating; qualities of its flesh; their note the loudest of all other birds; and often heard in the clouds, when the bird itself is unseen; amazing heights to which they ascend when they fly; though unseen themselves, they have distinct vision of every object below; extraordinary length and contortion of its windpipe; use made of their clangorous sound; they rise but heavily, are shy birds, and seldom let the fowler approach them; their depredations usually in the darkest nights; when they enter a field of corn, and trample it down, as if crossed over by a regiment of soldiers; corn their favourite food, scarce any other comes amiss to them; Redi's experiments to this purpose; a little falcon pursues, and often disables it; methods used on such occasions by those fond of hawking; barbarous customs of breeding up the cranes to be thus baited; easily tamed; Albertus Magnus says, it has a particular affection for man; the female distinguished from the male, by not being bald behind; never lays above two eggs at a time; the young are soon fit to fly; and unfledged, they run with such swiftness that a man cannot easily overtake them; Aldrovandus assures us one was kept tame for above forty years; the vulgar bear the crane a compassionate regard; prejudices in its favour; a heinous offence in some countries to kill a crane: distinctions between the crane and the stork, 160 *to* 166.

Crane, the *Balearic*, from the coast of Africa, and the Cape de Verde islands, its description; habits; has been described by the name of the sea-peacock; real Balearic crane of Pliny; foreign birds of the crane kind, described; the jabiru, the jabiru-guaca; the anhima; the buffoon bird, or Numidian crane, described, iii. 168 to 170; place where the crane kind seem to have formed their general rendezvous, 177; the flamingo the most remarkable of all the kind, the tallest, bulkiest, and most beautiful, described; small birds of the crane kind, 182.

Crants. See *Krants*, i. 101, 102.

Crœsus, (king of Lydia,) seated on his throne, with all the barbarous pomp of Eastern splendour, asking Solon if he had ever beheld any thing so fine? was answered, that after the beautiful plumage of the pheasant, he could be astonished at no other finery, iii. 95.

Cricetus, the *German rat*, by Mr. Buffon called the hamster, its description; is the greatest pest in the countries where found, and every method made use of to destroy it; its hole a curious object for contemplation; shows a skill superior to the rest of the rat kind; description of it; their store-houses; contain two bushels of good grain in each apartment; means of finding out their retreats; produce young twice or thrice a-year, and bring five or six at a time; their devastations produce a famine; they destroy each other; their fur very valuable, ii. 208, 209.

Cricket, a ruminating insect, or seemingly so, ii. 28; difference from the grasshopper; their voice; food, iv. 145; never drink; sound of drums and trumpets make them forsake their situation, 146.

Cricket (*mole*) described, thought to be amphibious, iv. 146; the number of their eggs; a most detested insect by gardeners; its devastations; precautions of the female against the black beetle; their care and assiduity in the preservation of their young, 147.

Croches, in the head of the stag, ii. 68.

Crocodile, extraordinary combat between this animal and the tiger, ii. 118; the ichneumon discovers and destroys its eggs; kills its young, and sometimes entering the mouth of the crocodile, when sleeping on the shore, effectually destroys it, ii. 167; the eggs it lays in the sand, often amount to three or four hundred, 168; the places where found, together with their dimensions; description; several examples of taking a man out of a canoe from his companions, notwithstanding all opposition and assistance; terrible even upon land; its depredations; combats between the crocodile and the tiger; in what manner it seizes its prey; how a negro ventures to attack this animal in its own element; manner of taking it at Siam; often managed like a horse; a curb put into its mouth, and the rider directs it as he likes; manner of taking it along the rivers of Africa; pools of water where bred as we breed carp in our ponds; in Egypt and other long-peopled countries, this animal solitary and fearful; in the river San Domingo, they are most inoffensive, children play with them, and ride about on their backs; beat them without receiving the smallest injury; probable opinion, its musky substance amassed in glands under the legs and arms; its flesh; the eggs to the savages most delicate morsels; all breed near fresh waters; precautions in laying their eggs; the female having introduced her young to their natural element, she, and the male, become the most formidable enemies; the open-bellied crocodile, thought viviparous; has a false belly like the opossum, for the young to creep out and in, as danger or necessity requires; their age; produced to fight at the amphitheatre at Rome, iv. 64 to 71.

Croppers, a kind of pigeons, iii. 99.

Crossbill, a bird of the sparrow kind, iii. 142.

Crost-fox, an animal between the dog and fox, ii. 152. See *Isatis*.

Crown, in the head of a stag, ii. 68.

Crows, fetch and carry with the docility of a spaniel, iii. 108; the *carrion-crow* resembles the raven in appetites, laying, and manner of bringing up its young; the *Royston crow*, 182.

Cruelty, teaching the arts of cruelty, equivalent to committing them, iii. 8.

Crustaceous, animals of the lobster kind, iv. 6.

Cub, the fox is so called during the first year, ii. 148; born blind, like those of the dog, 149.

Cuckoo, fables invented of this bird now sufficiently refuted; where it resides in winter, or how provides for its supply during that season, still undiscovered; this bird somewhat less than a pigeon, shaped like a magpie, and of a grayish colour; is distinguished from all other by its round prominent nostrils; discovers itself in our country early in the spring, by its well known call; its note heard earlier or later as the season is more or less forward, and the weather inviting; from the cheerful voice of this bird the farmer instructed in the real advancement of the year; history and nature of this bird still in great obscurity; its call an invitation to courtship, used only by the male, generally perched upon a dead tree, or bare bough, repeating his song, which he loses when the genial season is over; his note pleasant though uniform; the female makes no nest; repairs to the nest of some other bird, generally the water-wagtail or hedge-sparrow, and after devouring the eggs of the owner, lays hers in their place; usually lays but one, and this the little foolish bird hatches with great assiduity, and when excluded, fondly thinks the ill-looking changeling her own; to supply this voracious creature, the credulous nurse toils with unwearied labour, not sensible she is feeding up an enemy to her race; the stomach of this bird is enormous, and reaches from the breast-bone to the vent; its food; naturally weak and fearful; the smaller birds form a train of pursuers; the wry-neck, in particular, the most active in the chase; supposed, in winter, to lie hid in hollow trees, or to pass into warmer climates; story of a cuckoo found in a willow log, in winter; probable opinion concerning its residence in winter; Brisson makes not less than twenty-eight sorts of this bird; and talks of one of Brazil, as making a horrible noise in the forests, iii. 123, 124; follows a very different trade from what its nurse endeavoured to teach it; and according to Pliny in time destroys its instructer, 220, 221.

Cuckoo-spit, or froth-worm, its description, iv. 148.

Cud, the hare, the rabbit, and the squirrel, placed by Pyerius among those that chew the cud; how far true is not determined, ii. 177.

Cuguacu apara, name in Brazil for the roe-buck, ii. 77.

Cummin-seed formerly used in dressing a hare in true Roman taste, ii. 181.

Cur, the cur-fox, ii. 130.

Curischaff, a lake where the sturgeon is found in greatest numbers, iii. 182.

Curlew, a small bird of the crane kind; its dimensions; places where found; manner of procuring its food; its habits; its nest, and number of eggs; a bird of passage; season of courtship, 182 to 186.

Currants, indigestible to man, when swallowed whole, iii. 54.

Currents of rivers well explained by the Italians, i. 84; side current; back current, 85; sometimes the current at bottom swifter than at top, and when; double current, 86; found to run in all directions; manner in which mariners judge of the setting and rapidity of the current; currents are generally found most violent under the equator; a passage with the current gone in two days, with difficulty performed in six weeks against it; currents do not extend above twenty leagues from the coast; the currents at Sumatra extremely rapid, run from south to north; also strong currents between Madagascar and the Cape of Good Hope; but the most remarkable are those continually flowing into the Mediterranean sea; current runs one way at top, and the ebb another way at bottom, i. 107, 108.

Current of air, driven through a contracted space, grows more violent and irresistible, i. 142.

Cusco, Garcilasso de la Vego asserts the air is so dry and so cold there, that flesh dries like wood without corrupting, i. 262.

Custom the form of the face seems rather the result of custom, i 249.

Cuttle-fish, its description; contrivance with which it is furnished by Nature, when under a difficulty of escaping, iv. 214, 215.

Cybotus, a lofty mountain swallowed by an earthquake, i. 69.

Cynocephalus, the magot of Buffon, the last of the ape kind; its description; is a native of Africa, and the East, ii. 256.

Cyprinus, or the carp, iii. 288. See *Carp*.

Czar of Russia. See *Peter*.

D.

Dam, in the rapacious kinds, leads her young forth for months together; it is not so with those of the hare kind, ii. 178.

Dampier, has added more to natural history than half the philosophers before him, iv. 21

Damps, of various natures in mines; the fulminating sort, i. 38, 39.

Dance, hares taught to dance to music, ii. 179.

Dancer, a dog of the mongrel kind, iii. 134.

Dane, the tallest dog bred in England, ii. 132. 133.

Danube has seven openings into the Euxine Sea, i. 58; proceeds from the Alps, 58; its course; the Turks and Christians have fleets of men of war upon it, 87; it receives thirty lesser rivers, 90; the huso, or isinglass-fish, caught in great quantities in this river, iii. 277.

Dara, its inhabitants use ostriches as horses, iii. 50.

Darien, an isthmus; has a particular hog called waree; described by Wafer, ii. 99.

Darkness, surprising how far the eye accommodates itself to it, i. 220; remarkable instance of it in a gentleman, a major under Charles the First, 220.

Daubenton gives a complete history of a dwarf, i. 255.

Deaf men often found to see the force of those reasonings which they could not hear, understanding every word as it was spoken, i. 194; one born deaf, must necessarily be dumb; instances of two young men, who, born deaf, were restored to hearing, 225; a person born deaf, by time and pains, taught to write, read, speak, and, by the motion of the lips, to understand what is said; instances of it, 226.

Deafness one of the most common disorders in old age; way to know this defect either internal or external, i. 225.

Death, a young man born deaf and dumb, knew nothing of death, and never thought of it till the age of twenty-four, when he began to speak of a sudden, i. 226. a spectre, which frights us at a distance, but disappears when we come to approach it, 238; uncertainty of the signs of death, 238.

Deer, annually shedding horns, and their permanence in the sheep, draws a distinct line between their kinds, ii. 39; the little Guinea-deer, the least of all cloven-footed quadrupeds, and most beautiful; its description, 56; the male in Guinea has horns, but the female is without; they abound in Java and Ceylon, 57; all of the deer kind want the gall-bladder, 60; a downy substance, like velvet, upon the skin, covering the skull of a deer, when the old horn is fallen off; their horns grow differently from those of sheep or cows; they are furrowed along the sides, and why, 62; the bran-deer, or the brown-deer, called by the ancients tragelaphus, found in the forests of Germany; the new continent of America produces animals of the deer kind in sufficient plenty, 71.

Deer, (*Fallow*,) no animals more nearly allied than the stag and fallow-deer, yet they never herd nor engender together, nor form a mixed breed; each form distinct families, and retain an unalterable aversion; the fallow-deer rarely wild in the forests; are in general bred in parks, and their flesh is preferred to that of any other animal; a herd of them divides into two parties, and engages each other with great ardour and obstinacy; both desirous of gaining a favourite spot of the park for pasture, and of driving the vanquished into the more disagreeable parts; manner of their combats; are easily tamed; and browze closer than the stag; they seek the female at their second year; their strength, cunning, and courage inferior to those of the stag; we have in England two varieties of the fallow-deer, one brought from Bengal, the other from Norway; flesh of the French fallow-deer, has not the fatness or the flavour of that fed upon English pasture; Spanish and Virginia fallow-deer; deer without horns, their description, ii. 72 to 74.

Deer, (*Rein*,) the most extraordinary and most useful; native of the icy regions of the North; it answers the purposes of a horse; attempts made to accustom it to a more southern climate, in a few months it declines and dies; answers the purposes of a cow in giving milk, and of the sheep in furnishing warm clothing to the people of Lapland and Greenland; description of the rein-deer; its rutting-time, and that of shedding its horns; difference between this deer and the stag; it is not known to the natives of Siberia; Americans call it caribou; herdsmen of Lapland known to possess a thousand rein-deer in a single herd; it subsists upon moss; and makes the riches of the people of Lapland; gnats and gadflies very formidable to this deer in Lapland; female brings forth in May; its milk thinner than that of the cow; sweeter and more nourishing; is of two kinds in Lapland; it draws sledges; can go about thirty miles without halting, and without dangerous effort; generally castrated by the Laplanders; one male left for six females; begin to breed when two years old; go with young eight months, and bring two at a time; fondness of the dam remarkable; live but fifteen or sixteen years; manner in which the Laplanders kill them; scarce any part of this animal not converted to peculiar uses; the Laplanders find their necessities supplied from the rein-deer alone; in what manner; diseases of this animal; the blood of the rein-deer preserved in small casks, for sauce with the marrow in spring; the horns converted into glue; their sinews make the strongest sewing-thread; the tongues a great delicacy; the intestines, washed like our tripe, in high esteem among the Laplanders; bears make depredations upon the rein-deer; glutton its most dangerous and successful persecutor; only method of escape from this creature

80 to 88. in what manner the rein-deer is killed by it, 159; the wolf never attacks a rein-deer that is haltered in Lapland, and why, 146.

Deformity, children often inherit even the accidental deformities of their parents; instances of it; accidental deformities become natural; by assiduity continued and increased, through successive generations, i. 249; all those changes the African, the Asiatic, or the American undergo in their colour, are accidental deformities, probably to be removed, 251.

Demoiselle, name given by the French to the Numidian bird, ii. 163.

Denmark. See *Henry IV*.

Depona, a large serpent, native of Mexico, iv. 103.

Derbent, pastures in these plains excellent for rearing horses, ii. 12.

Derbyshire, description of the nest of an eagle found in the Peak of Derbyshire, iii. 62

Derham, by a microscope, discovered in the eye of a mole, the parts known in other animals, ii. 213.

Desman, one of the three distinctions of the musk-rat; a native of Lapland, ii. 207.

Devil, the Swedish Laplanders consult him, i. 240.

Dew compensates the want of showers in Egypt, i. 143.

Dewlap. See *Zebra*, ii. 25. See *Cow*, ii. 31.

Diableret, a mountain in France suddenly fallen down; its ruins covered an extent of a league square, i. 67.

Dictionaries of Arts and Sciences, a fault that has infected most of them, i. 275.

Diet of a thin sparing kind remarkable among quadrupeds, as well as the human species, to produce hair, iii. 165.

Digester, an instrument; meat and bones put into it, dissolved into a jelly in six or eight minutes, i. 125.

Digestion, these organs in birds are in a manner reversed, iii. 32; is not perfect in all birds that live upon mice, lizards, or such like food, 80; performed by some unknown principle in the stomach, acting in a manner different from all kinds of artificial maceration; this animal power lodged in the maw of fishes, iii. 234, 235.

Diseases of the rein-deer; the manner in which the Laplanders cure them, ii. 88.

Disorders, infectious, propagated by the effluvia from diseased bodies, i. 132; most of these incidents to mankind, says Bacon, arise from the changes of the atmosphere, iii. 237; fishes have their disorders, 300.

Diver (the great northern), a bird of the smaller tribe of the penguin kind; the grey-speckled diver; the scarlet throated diver, iii. 210.

Divers known to descend from twenty to thirty fathom, i. 117; of all those who have brought information from the bottom of the deep, Nicola Pesce the most celebrated; account of his performances by Kircher, 119; some known to continue three quarters of an hour under water, without breathing; they usually die consumptive; manner of fishing for pearls, iv. 43.

Dodo, its description, iii. 55; among birds, as the sloth among quadrupeds, an unresisting animal, equally incapable of flight or defence; native of the Isle of France; the Dutch first discovered and called it the nauseous bird; travellers deem its flesh good and wholesome; it is easily taken; three or four dodoes enough to dine a hundred men; whether the dodo be the same bird with that described under the name of the bird of Nazareth, remains uncertain, 56.

Doe, the female of the deer kind, ii. 73.

Dogs, always running with their noses to the ground, supposed of old the first that felt infection, i. 128; no other animal of the carnivorous kind will make a voluntary attack, but with the odds on their side, 279; the Arabian horses outrun them, ii. 8; in the dog kind the chief power lies in the under-jaw, 101; in Syria, remarkable for the fine glossy length and softness of their hair, 105; in tropical climates, lose the delicacy of their scent, and why; the lion, tiger, panther, and ounce, all natural enemies to the dog, 123; dog kind not so solitary as those of the cat; their proper prey are animals unfitted for climbing; they can live for some time upon fruits and vegetables, 127; description of the dog; knows a beggar by his clothes, by his voice, or his gestures, and forbids his approach, 128; the dog most susceptible of change in its form, 129; all dogs are of one kind, which the original of all the rest, which the savage dog, whence such a variety of descendants is no easy matter to determine; the shepherd's the primitive animal of his kind; those wild in America and Congo, as those of Siberia, Lapland, Iceland, of the Cape of Good Hope, of Madagascar, Madura, Calicut, and Malabar, resemble the shepherd's dog; those in Guinea, at the second or third generation forget to bark; dogs of Albany, of Greece, of Denmark, and of Ireland, larger and stronger than any other; shepherd's dog, transported into temperate climates, and among people entirely civilized, from influence of climate and food alone, becomes a matin, a mastiff, or a hound; *Turkish dog*; *great Danish dog*; *great* *wolf dog*, or *Irish wolf dog*; the *little Danish dog*; their variety now in England much greater than in the times of Queen Elizabeth; Dr. Caius divides the whole race into three kinds; the generous, the farm-kind, the mongrel, 129 to 133; three shepherd's dogs reckoned a match for a boar, and four for a lion; three of them overcame a lion in the time of king James the First; the famous poet Lord Surry, the first who taught dogs to set; the *pug dog*; the English *bull dog*; the *lion dog*; originally from Malta; its description; the *Molossian dogs* of the ancients, according to Mr. Buffon; *Epirotic dogs*, mentioned by Pliny; *Indian dogs*, mentioned by Ælian; his description of a combat between a dog and a lion; the bravest of the kind; the nobler kinds of dogs, of which such beautiful ancient descriptions, now utterly unknown, 134, 135; puppies' eyes not open till ten or twelve days old; dog's teeth amount to forty-two; this animal capable of reproducing at the age of twelve months; goes nine weeks with young, and lives about twelve years; other particulars concerning dogs; many kinds of birds the dogs will not touch; dogs and vultures living wild about Grand Cairo in Egypt, continue together in an amicable manner, and are known to bring up their young in the same nest; dogs bear hunger for a long time; a bitch forgotten in a country-house, lived forty days without any other sustenance than the wool of a quilt she had torn in pieces, 138, 139; the wild hunt in packs; unknown, such as he was before the protection of man; some from a domestic state, have turned savage, and partaken of the disposition of the wolf, and attack the most formidable animals of the forest; are easily tamed, and quickly become familiar and submissive, 128; experiments to prove the wolf and the fox not of the same nature with the dog, but of a nature perfectly distinct; animals in this country bred between a dog and a fox; a dog set at liberty, in his savage fury flew upon every animal, fowls, dogs, and men, 138; the dog and the wolf so much alike internally, that anatomists can scarce perceive the difference, 140; a young dog shudders at the sight of a wolf; dogs and wolves so different in their dispositions, that no animals have a more perfect antipathy, 141; by instinct, without education, dogs take care of flocks and herds, 142; show no appetite to enjoy their victory when the wolf is killed, but leaves him where he falls, 144; Catesby asserts the wolf was the only dog used by the Americans, before the Europeans came among them, and they have since procreated together; thus proving the dog and the wolf of the same species; unsurmountable antipathy between the dog and the jackal; they never part without an engagement, 152; famished dogs more hairy than those whose food has been more plentiful, 158; all kinds pursue the hare by instinct, and follow it more eagerly than other animals, 178; few dogs dare to encounter the otter; some purposely trained for discovering the retreat of the otter, 236.

Dog butchers all over China, and shambles for selling their flesh; wherever a dog butcher appears, all the dogs of the place are in full cry after him; along the coasts of Guinea, their flesh is esteemed a delicacy by the Negroes; they give a cow for a dog, ii. 137.

Dolphin caught in the Red Sea, known by a ring to be the same taken before in the Mediterranean, i. 108; allured by music, 223; not easy to assign a cause why the ancients have invented so many fables on the subject; their boundings in the water, have taught mariners to prepare for a storm; old painters and sculptors have drawn them wrong; the poets have adopted the error; Pliny has asserted, they instantly die when taken out of the water; Rondelet assures us, he has seen a dolphin carried alive from Montpelier to Lyons; their motions the gambols of pleasure, or the agitations of terror, not well known; in fair weather they herd together, and pursue shoals of various fish with impetuosity, iii. 256.

Dolphin is also the name of the ophidium, or the gilt-head, iii. 265.

Don, or *Tanais*, a river, its course, i. 87; the sturgeon is caught in great quantities at the mouth of that river, iii. 275.

Dorado, supposed a ruminating fish, ii. 28; a fish of the spinous kind, the most voracious; its description; the flying-fish is chiefly sought by it; warfare carried on between them, iii. 298.

Doree, description of this fish, iii. 286.

Dormouse, the mercury of the thermometer plunged into the body of a living dormouse never rose beyond its pitch in air, and sometimes sunk above a degree, ii. 195; the greater sort Mr. Buffon calls the *loir*, the middle size he calls the *lerot*, and the less he denominates the *muscardin*; their descriptions; agree in being stupified like the marmot during winter; their nest and provisions; they bring forth three or four young at a time, but once a year, in spring, 207.

Dor-beetle, or *May-bug*, iv. 197. See *Beetle*.

Dottrel, small bird of the crane kind, iii. 182.

Doves. the *stock-dove*, iii. 131; the *turtle-dove*, 133; the *ring-dove*, 134. See *Pigeon*.

Douc, a monkey of the ancient continent, so called in Cochin-China, where it is native; its description; forms part of the chain by which the monkeys of one continent are linked with those of the other, ii. 267.

Draco volans, a flying ball of fire, i. 151.

Drag, name given by the huntsmen to the tail of a fox, ii. 149.

Dragons, the whole race dwindled down to the flying lizard, iv. 77.

Dragon-fly, or the *libella*, described, iv. 133.

Dragonet, description of this fish, iii. 285.

Dress, the first impression generally made, arises from dress, i. 197

Drill, of Purchas, an ape of the kind of the ouran-outang, ii. 250.

Dromedary, a sort of camel, iii. 5.

Drone, a ruminating insect, or seemingly so, ii. 28.

Drones, the second sort of bees, supposed to be the males, iv. 175; their cells, 177; the working-bees kill the drones in the worm state in the cell, and eject them from the hive among the general carnage, 182.

Drugs, in the tropical climates lose their virtue, and become verminous, i. 127.

Drum, among the Swedish Laplanders every family has one for consulting the devil, i. 140; hares taught to beat the drum, ii. 160.

Dryness, a great degree of it produced by heat, preserves from corruption, ii. 262.

Duck, when ducks are caught, the men keep a piece of turf burning near their mouths, and breathe upon it, lest the fowl smelling them should escape, iii. 31; of the numerous tribes of the duck kind, no more than five breed here, 39; Plutarch assures us, Cato kept his family in health, feeding them with duck whenever they threatened to be out of order, 215; its eggs often laid under a hen; seems a heedless inattentive mother; of the tame duck, ten different sorts; and of the wild, Brisson reckons above twenty; the most obvious distinction between the wild and tame ducks; difference between wild ducks among each other; sea, and pond ducks; names of the most common birds of the duck kind, among ourselves, and of the most noted of the foreign tribe; their habits, nests, and number of eggs; are, in general, birds of passage; their flesh; the ducks flying in the air, often lured down from their heights by the loud voice of the mallard from below; what part of the lake they generally choose; what can employ them all day, not easy to guess; manner of making and managing a decoy to take them; the American wood-duck, 221 to 224; general season for catching them in decoys, from the end of October till February; taking them earlier prohibited by an act of George the Second, imposing a penalty of five shillings for every bird destroyed at any other season; amazing quantity of ducks sent to supply the markets of London; manner of taking them frequently practised in China, 225.

Dumb. See *Deaf*, i. 225.

Dung, some animals void it when pursued; this arises rather from fear than a desire of defence, ii. 38.

Dunlin, a small bird of the crane kind, iii. 182.

Dutch, solicitous about the preservation of the stork, in every part of their republic, iii. 167.

Dwarf, in England, as late as the time of king James the First, the court was furnished with one; and he was called Little Jeffrey; Peter of Russia celebrated a marriage of dwarfs, i. 253, 254; they seem to have faculties resembling those of children; history of a dwarf accurately related by Mr. Daubenton, 255.

Dwina, a river; its course and source, i. 87.

E.

Eagle-kind, the flap of an eagle's wing known to lay a man dead in an instant, iii. 30; it flies at the bustard or the pheasant, 58; distinctive marks from the other kinds of carnivorous birds; the golden eagle is the largest and noblest of all those birds designed by the name of eagle; its description; considered among birds, as the lion among quadrupeds; strong similitude to each other; great patience, and much art, required to tame an eagle; though taken young, and brought under by long assiduity yet it is a dangerous domestic, and often turns its force against its master; sometimes has an attachment for its feeder; it is then serviceable and will provide for his pleasure and support; flies the highest of all birds, and from thence has by the ancients been called the bird of heaven; it has also the quickest eye; but its sense of smelling is far inferior to that of the vulture; it never pursues, but in sight; finds difficulty in rising when down; carries away geese, cranes, hares, lambs, and kids, and often destroys fawns, and calves, to drink their blood, and carries a part of their flesh to its retreats; infants, when left unattended, have been destroyed by these rapacious creatures; the eagle is peculiarly formidable when bringing up its young; a poor man got a comfortable subsistence for his family, during a summer of famine, out of an eagle's nest, by robbing the eaglets of food; eagles killed a peasant who had robbed their nests; there is a law in the Orkney islands, which entitles any person to a hen out of every house in the parish, in which the plunderer is killed; the nest of the eagle is usually built in the most inaccessible cliff of the rock; description of one found in the Peak of Derbyshire; it hatches its eggs for thirty days; very rare to find three eaglets in the same nest; and it is asserted, that the mother kills the most feeble, or the most voracious; it is believed they live about an hundred years, and that they die, not of old age, but from the beaks turning inward upon the under-jaw, and preventing their taking any food; an eagle endured hunger for twenty-one days, without any sustenance whatever; they are first white, then inclining to yellow, and at last light brown, age, hunger, captivity, and diseases, make them whiter; those kept tame are fed with every kind of flesh; fresh or corrupting; and upon a deficiency of that, bread, or any other provision, will suffice; it is dangerous approaching them, if not quite tame, and they sometimes send forth a loud piercing lamentable cry, which renders them still more formidable; they drink but seldom, and perhaps when at liberty, not at all; the bald eagle an inhabitant of North Carolina; breeds in that country all the year round; manner in which the eggs are hatched; characteristics and habitudes of this animal; its nest is large enough to fill the body of a cart, and commonly full of bones, half eaten, and putrid flesh, the stench of which is intolerable, 60 to 63

Eagle, the *sea-eagle* called *aquila piombina* by the Italians; they often lay three or four eggs, of a less size than those of a hen, of a white elliptical form; distinctive marks of the *golden eagle*, of the *common eagle*, of the *bald eagle*, of the *white eagle*, iii. 63; of the *rough-footed eagle*, of the *white-tailed eagle*, of the *erne*, of the *black eagle*, of the *sea eagle*, of the *osprey*, of the *jean le blanc*, of the *Brasil eagle*, of the *Oroonoko eagle*, of the *crowned African eagle*, of the *eagle* of *Pondicherry*, iii. 64.

Ears, distinguishing features in quadrupeds; serve in them as principal marks of the passions; smallest ears in men said to be most beautiful; the largest the best for hearing; some savage nations bore their ears, and draw that part down, till the tip of the ear rests upon the shoulder, i. 195; "the richest jewels in an Æthiop's ear," a proverb, 197; undulations, which strike the ear, supposed but one continued sound, by their quick successions, though in reality they make many, 221; persons hear differently with one ear from the other; these have what musicians call a bad ear; and as hearing false, also sing false; such persons also deceived as to the side whence the sound comes, 225; from what cause the long ears of the Tartars and Chinese, 259; those of the hare moveable, and capable of direction to every quarter, ii. 177; are remarkably good, 179; birds have not the external ear standing out from the head; probably the feathers encompassing the ear-holes, supply the defect of the exterior ear, iii. 31.

Earth, its globe a million of times less than the sun, i. 9; placed at a happy distance from the centre, in our solar system; less distant from the sun than Saturn, Jupiter, and Mars, and less parched up than Venus and Mercury, situated too near the violence of its power; the earth, like a chariot-wheel, has a compound motion; its rotundity proved, 11; is rather flatted at the poles, and its form resembles that of a turnip, 12; considered as one scene of extensive desolation, 16; supposed by Buffon a globe of glass; by Whiston a sphere of heated iron; by Kircher one dreadful volcano; by Burnet a great mass of water; composed of different layers or beds, lying horizontally one over the other, like the leaves of a book, 17

Earth (*garden*,) or mound earth, a kind of mother, never found an enemy to man, 27; black earth formed by decayed leaves and branches in Burgundy, 29; drying and astringent earth preserves bodies from corruption, 243; all such earths as ferment with vinegar, are a composition of shells, decayed, and crumbled down to one uniform mass, iv. 27.

Earthquakes, frequent through the whole region where a volcano is situated, i. 41; various kinds of them distinguished by philosophers; and by Mr. Buffon; air the only active operator in them; several opinions upon the cause of them; activity of internal heat alone sufficient to account for every appearance attending earthquakes; twelve cities in Asia Minor swallowed up in one night; extraordinary earthquake related by Pliny; account of that in the year 1693, extending to a circumference of two thousand six hundred leagues; minute description of that in Jamaica in 1792, 47 to 53 account of the dreadful shock in Calabria in 1638, 51; concomitant circumstances attending earthquakes, 54.

Earth-worm of America often a yard in length, and as thick as a walking cane, i. 162; multiplied by being cut in pieces, i. 168; its description, iv. 211. See *Worms*

Ear-wig, its habits; reproaches groundless about this animal; its food, iv. 147; general characteristics of the kind; lives in its winged state a few days; dies to all appearances consumptive, 148.

East-Indies, favourable months of embarking for them, i. 139.

Echeneis, the sucking fish; its description, iii. 287

Echini, or urchins, a multivalve shell-fish, iv. 44. See *Urchins*.

Echo, no art can make an echo, i. 224.

Edgar, King of England, the first who attempted to rid this kingdom of wolves, and in what manner, ii. 145.

Edward I. issued his mandate to Peter Corbet to superintend, and assist in the destruction of wolves, ii. 145.

Edward III. made it felony to steal a hawk. iii. 71.

Edward IV. his act concerning swans, iii. 217.

Eel described, iii. 287.

Effluria from diseased bodies propagate disorders called infectious, i. 132.

Eggs, all birds, most fishes, and many of the insect tribes brought forth from eggs; warmth of the sun, or of a stove, efficacious in bringing the animal in the egg to perfection; its description; history of the chicken in the egg to its complete formation, i. 170 to 173; quadrupeds brought forth from the egg, above two hundred at a time, 257; the ichneumon discovers and destroys the eggs of the crocodile, ii. 167; the crocodile lays in the sand at a time three or four hundred, 168; some eggs only addled by incubation, iii. 35; birds who are undisturbed lay but two or three eggs, when their eggs are stolen, lay ten or twelve; a common hen, moderately fed, lays above one hundred from the beginning of spring to the latter end of autumn, 38; some of the ostrich's weigh above fifteen pounds, 48; Galen thought the eggs of hens and pheasants good to be eaten; those of geese and ostriches are the worst of all, 50; and those hatched in the hot sand, where laid, 52; taking the eggs of a hawk punished with imprisonment and a fine, at the king's pleasure, in the reign of Edward III. 71; inhabitants of Norway prepare from the eggs of the porpoise a kind of caviar, or delicate sauce, and good when eaten with bread, 257; manner in which the eggs of fishes are impregnated, wholly unknown, 296; doubts whether fish come from the egg completely formed, 297; those of the turtle hatched by the sun, iv. 22.

Eggs (*Sea*,) name given in our cabinets to a multivalve shell-fish called echini, or urchins, by naturalists, iv. 44; those of the sea-urchin a great delicacy, 45; opening the body of a queen-bee, there appeared in it five thousand eggs, 179.

Eglantine, found at a well dug at Marly, i. 30.

Egypt has south winds so hot during summer, that respiration is almost stopped by them; they are charged with such quantities of sand, that they darken the air, as with a cloud; it rains very seldom in that country; but the want of showers is compensated by the copiousness of their dews, i. 143; the catacombs, 264; a mummy, not long since dug up in France, shows the art of embalming was more completely understood in the western world, than in Egypt itself, 266; the Tingitanians and Egyptians have now the fame of rearing the finest horses, both for size and beauty, ii. 10; the ichneumon used in this kingdom, for the same purposes that cats are in Europe, 146.

Egyptian. See *Embalming*. See *Ibis*.

Eider duck, iii. 221; remarkable for the warmth of its nest, 222.

Elaboratory, bowels of ruminating animals considered as an elaboratory, with vessels in it, ii. 27; the chemical apparatus for hatching chickens, iii. 89.

Elasticity, of the air, i. 125.

Elder-berries hurtful to cocks, iii. 90.

Elephant, not afraid singly to make opposition to the lion, ii. 110; not less remarkable for its size than its docility; all historians concur in giving it the character of the most sagacious animal next to man; its height from seven to fifteen feet; impossible to give an idea of this animal's figure by description; assisted by the art of the engraver, it will but confusedly represent the original; general observations about its conformation; of all quadrupeds, the elephant the strongest and largest, yet neither fierce nor formidable; in its native deserts seldom alone, being a social, friendly creature; the oldest conducts the band; the next in seniority brings up the rear; order maintained in dangerous marches; never so far asunder as to be incapable of reciprocal assistance; their invasions the more disagreeable, there being no means of repelling them, since an attempt to molest a drove would certainly be fatal; manner of going against him who offers the insult; do no personal injury when suffered to feed uninterrupted; molested by man they seek all occasions to be revenged; where they like best to live in their natural state; cannot live far from water, and always disturb it before they drink; often fill their trunk with water, to cool it, or by way of play to spurt it out like a fountain; equally distressed by the extremes of heat and cold; swim from the continent into islands some leagues distant; frequently migrate from one country to another, and why; their food of the vegetable kind, loathing all sort of animal diet; one finding a spot of good pasture, invites the rest to partake of it; precautions by Negroes and Indians against them; they often break through their fence, destroy the harvest, overturn their habitations, and then retreat in order, as they made the irruption; looks with attention and friendship at its master . its ears wipe its eyes, and cover them against the flies and dust; it likes music, learns to beat time, moves in measure, and joins its voice to the sound of the drum and trumpet; is pleased with the odours that delight man; the orange-flower particularly grateful to its taste and smell; picks up flowers, and is pleased with the scent; seeks the most odoriferous plants for food; prefers the cocoa, the banana, the palm, and the sago-tree to all others; eats plants to the roots; their sense of touching most delicate; description of its trunk: serving all the purposes of a hand; breathes, drinks, and smells through the trunk; takes a pin from the ground, and unties the knots of a rope, unlocks a door, and writes with a pen; Ælian saw an elephant write Latin characters on a board, his keeper only showing him the figure of each letter, ii. 273 to 276; an object too large for the trunk to grasp, is sucked up by its breath, lifted, and sustained; the trunk its organ of smelling, of touching, of suction, of ornament, and defence; its neck is so short that it must turn about to discover what is behind; how the hunters escape its resentment; a description of its legs; while young, it bends the legs, but when old, or sickly, it wants human assistance, and chooses to sleep standing; a description of its feet, and of its tusks; these with age, become so heavy that it is obliged to rest them in holes in the walls of its stall; they are two; their amazing size; they proceed from the upper jaw, not from the frontal-bones; and are not horns, as some have supposed; nor ever shed in a domestic state; extraordinary manner of eating; is not a ruminating animal; its stomach and intestines resemble those of a horse; opinion that the young elephant sucks with its trunk, not with its mouth; referred to future discoveries; the skin not covered with hair; a few bristles in the scars and wrinkles of the body, and thinly scattered over the skin; the hide resembles the bark of an old tree more than the skin of an animal; is subject to that disorder known by the name of the elephantiasis, or Arabian leprosy; in what manner the Indians endeavour to prevent it; the flies torment this animal incessantly; what arts it tries to keep them off; in a state of nature, it rarely quits the river, and often stands in water up to the belly, ii. 277, 278; from time immemorial employed for the purposes of labour, of war, to increase the grandeur of Eastern princes, or to extend their dominions; is a native of Africa and Asia; still retains its natural liberty in Africa; during the splendour of the Carthagenian empire they were used in the wars; no elephant found on this side Mount Atlas; places where they are in great numbers; the greatest elephants found in Asia; their price increases in proportion to their size; the largest kept for princes; their colour; that appropriated for the monarch's own riding, kept in a palace, attended by nobles, and almost adored by the people; opinions concerning the white elephant; the Eastern princes maintain as many elephants as they are able, and placé great confidence on their assistance in an engagement; they never breed in a state of servitude, and the generative powers fail when it comes under the dominion of man; duration of pregnancy in the female still a secret; what Aristotle and others say concerning this and their young is doubtful; method of taking them wild in the woods; Negroes of Africa who hunt this animal for its flesh, take it in pit-falls; its attachment to the person who attends it; it comprehends several of the signs made to it; distinguishes the tone of command from that of anger or approbation, and acts accordingly; executing orders with prudence, eagerly, yet without precipitation; is taught to kneel down, to receive its rider, usually mounted upon its neck; caresses those it knows, salute such as ordered to distinguish, and helps to take up part of its load; takes a pleasure in the finery of its trappings; draws chariots, cannon, or shipping, with strength, perseverance, and satisfaction, provided it be not corrected without a cause, and that its master be pleased with its exertions; in what manner the conductor guides it; frequently takes such an affection to its keeper, as to obey no other; has been known to die of grief for killing its conductor in a fit of madness; surprising instance of moderation in its fury; a word sufficient to put it in motion, 279 to 282; a century or two ago, the Indian generals made great dependence upon the number and the expertness of their elephants; of late they are little used, except for drawing cannon, and transporting provisions; still they are used in war in Siam, in Cochin-China, in Tonquin and Pegu; in what manner armed and led to battle; effects of its fury in the field; those placed upon its back, in a square tower, combat as from an eminence, and fling down their weapons with double force; nothing more dreadful or more irresistible than such moving machines to men unacquainted with the modern arts of war; Romans quickly learned the art of opening their ranks to admit the elephant, and separating it from assistance, compelled its conductors to sooth the animal's fury, and to submit; sometimes instead of obeying turned upon those it was employed to assist; one elephant is known to consume as much as forty men in a day; they are now chiefly employed in carrying or drawing burdens throughout the Peninsula of India; it can with ease draw more than six horses can remove; it carries upon its back three or four thousand weight, and upon its tusks it can support near a thousand; when pushed, it moves as swiftly as a horse at full gallop; it travels fifty or sixty miles a-day, and, hard pressed, almost double that quantity; heard trotting on at a great distance; its track is deeply impressed on the ground, and from fifteen to eighteen inches in diameter; used, in India, as executioners, and with what dexterity they perform the horrid task; sometimes they impale the criminal on their enormous tusks; two surprising instances how sensible it is of neglect: the keeper despising its endeavours when launching a ship, the animal redoubled its efforts, fractured its skull, and died upon the spot; revenge one of them took upon a tailor who pricked its trunk with a needle in Delhi; is mindful of benefits; instance of it; at the Cape of Good Hope they are hunted for the sake of their teeth: in what manner; an account of an unhappy huntsman; teeth of the elephant found in a fossil state; two great grinding teeth, and part of the tusk of an elephant discovered at the depth of forty-two yards in a lead-mine in Flintshire; tusks of the elephants that come from Africa, seldom exceed two hundred and fifty pounds; it is defeated by the rhinoceros, 282 to 285.

Elephantiasis, or the Arabian leprosy, a disease to which man and the elephant are equally subject; in what manner the Indians endeavour to prevent it, ii. 276.

Elisabeth (*Queen*,) her injunction upon fasting, i. 209; in her times, the whole kingdom could not supply two thousand horses to form the cavalry, ii. 16.

Ellis, his principal experiment upon coralline substances, iv. 221.

Elk, its size equal to that of the elephant, ii. 77; is an animal rather of the buck than the stag kind; known in America by the name of the moose-deer; is sometimes taken in the German and Russian forests; but extremely common in North America; its horns fortuitously dug up in many parts of Ireland, measuring ten feet nine inches from tip to tip; a small one, the size of a horse, and the horns little larger than those of a common stag; Jocelyn and Dudley describe this animal about eleven feet high; others extend their accounts to twelve and fourteen feet; never disturbs any other animal, when supplied itself; a female of this kind shown at Paris in the year 1742; its description; they gave it thirty pounds of bread every day, besides hay, and it drank eight buckets of water, 77, 78.

Elk (*American*,) of two kinds, the gray and the black; described; they prefer cold countries, feeding upon grass in summer, and the bark of trees in winter; time and manner of hunting them; its flesh very well tasted, and very nourishing; its hide strong, and so thick as to turn a musket-ball; yet is soft and pliable; this animal troubled with the epilepsy; is but very indifferently and confusedly described by travellers; their various descriptions, ii. 79, 80; in what manner killed by the glutton, 173.

Elops, or *Sea-serpent*, its description, iii. 286.

Ely, an island, the country round it was once a most delightful spot; produced grapes that afforded excellent wine; the sea breaking in, overwhelmed the whole country, i. 114.

Emanuel (*king of Portugal*,) to try the strength of the elephant and rhinoceros, made them fight, and the elephant was defeated, ii. 286.

Embalming, the Egyptians carried this art to perfection; copious detail of this art as practised among them; in Genesis, Joseph seeing his father expire, ordered his physicians to embalm the body, i. 260; various methods of embalming, 261; the art still among the Guanches, ancient inhabitants of the island of Teneriffe, when the Spaniards conquered it; particulars of their method of embalming; the Peruvians also understood this art, according to Father Aeasto, 261, 262; a mummy lately dug up in France, shows the art more completely understood in the western than the eastern world, 266.

Embroidery, done in India with porcupine quills, as belts, baskets, and necessary pieces of furniture, ii. 221.

Embryo, its first rudiments; in a month an inch long; the male developes sooner than the female; progress and increase of it, i. 176 to 178; in the human, the underjaw much advanced before the upper, 194; brain and spinal marrow, first seen begun, 214; the bones as soft as the flesh, i. 233.

Emigration, causes of emigration of birds, iii. 38; manner performed, 39, 40.

Emu, an inhabitant of the New Continent, called also the American ostrich; description and places where found; runs so swiftly, the dogs lose the pursuit; one surrounded by hunters, the dogs avoided its rage; peculiar in hatching its young the young at first familiar; follow any person; as they grow older, become cunning and distrustful; their flesh good to be eaten; they live entirely upon grass, iii. 51, 52.

Encoubert of Buffon, the tatou of Ray, a shelly quadruped, ii. 226.

England claims dominion over the seas encompassing Great Britain and Ireland; losing its superiority upon the ocean, its safety becomes precarious, i. 96; late as

King James I. the court still furnished with a dwarf, a giant, and a jester; the ass entirely lost under queen Elizabeth, ii. 21; not infested with wolves, 145; the viper, the only venomous animal there, iv. 95.

Enquiries most intricate generally most useless, i. 168.

Entry, a term in chase of the stag, ii. 68.

Ephemera, various kinds of this insect; its description; colours of their aurelias; their transmutations; places where found in abundance; short duration; their impregnation, iv. 150 to 152.

Epicure, the greatest has the most depraved taste, i. 229.

Epiphanius (*St.*) lived a hundred and fifteen years, i. 209.

Equator, description of the regions under it, i. 13.

Ermine, its description; alike in figure to the weasel; its fur the most valuable of any; the time in which it is called the stoat; manner of moulting its hair; one ate honey, and died shortly after; proof of a distinct species from the pole-cat or the martin; one of these fed with eggs and flesh, let them putrefy before it touched either; in Siberia, taken in traps baited with flesh, and in Norway, shot with blunt arrows, or taken in traps; sometimes found white in Great-Britain, and is then called the white weasel; its fur among us of no value, ii. 158 to 160; preys upon the leming, 212.

Erne, kind of eagle; its distinctive marks, ii. 87.

Eruption of a volcano, remarkable, in 1537, i. 42; of Vesuvius, in which Pliny the naturalist was suffocated, and the city of Herculaneum was overwhelmed; another of the same mountain, in 1707, described; of Cotopaxi, in 1743, described by Ulloa; matter thus exploded lies a little below the bed of the mountains, in Mr. Buffon's system; but supplied from the deeper regions of the earth, 42 to 47.

Esculapian, serpent of Italy; its excrement a pleasing perfume, iv. 88; a domestic creature, 102.

Esox, or the pike, a description of this fish, iii. 268.

Esquimaux Indians described, i. 240.

Evaporation, cold diminishing the force of menstruums, promotes evaporation; theory for the formation of the clouds, i. 147; prevented by moist weather; dry frost assists evaporation, 148.

Evils, thousands of natural evils permitted to exist in the world, and why, i. 16.

Eunuchs, of two kinds, the white and the black, i. 187; made in Italy to improve the voice; instance, in our country, of a very fine woman married to an eunuch, 188.

Euphæmia, a city in Calabria, sunk by an earthquake, i. 53.

Euphrates, a river, its sources, i. 88; receives eleven rivers, 91.

Eurites, a city swallowed by an earthquake, i. 69.

Europeans, resemble our common parent more than any of the rest of his children, i. 249; argument which suffices to prove it, 181.

Eustachian tube, a passage from the ear into the mouth; its use, i. 224.

Ewe. See *Buck-goat*, ii. 39.

Excrements of some serpents kept as the most pleasing perfume at Calicut and Cranganon, in East India, iv. 88.

Executioner, elephants in India used as such; impale the criminals on their tusks, ii. 283.

Exhalations, mineral, raised by subterranean heat, i. 136; when copious, every where fatal, 131.

Exocetas, the flying-fish, its description, iii. 288.

Experience, repeated, shows how seldom pains are suffered, or pleasures enjoyed. to the utmost, i. 238.

Experiment, by Mr. Belcher, upon the circulation of the blood through the bones, i. 233; made by approaching a looking-glass to the mouth to discover breathing, very uncertain, 238; of a carp placed under an air-pump, iii. 236; the famous experiment of Malpighi, concerning the stigmata of the caterpillar, iv. 157.

Extraneous, or fossil shells, found in the bowels of the earth, iv. 28.

Eyes, opened by the infant the moment of its birth, i. 186; particularly in them the passions are painted, 190; small and nearly closed, are liked in China and Japan, 189; different colours of the eye, whence they arise; eyes of oxen are brown; those of sheep of a water-colour; of goats are gray; and those of most white animals are red, distance between the eyes less in man than in any other animal, 191; Montaigne disliked those men who shut one eye in looking upon any object, 195; in what circumstances women with child are said to be all mouth and eyes; the lower eye-lids, in women with child, drawn downwards, 199; of all parts the animal has double, the eyes produced soonest, 214; privation of feeling and sight would misrepresent the situation and number of all things around us, 215; two contribute to distinct and extensive vision, 216; both eyes see round the object, and give it that heightened relief which no painting does attain to; in either, if there be a point which has no vision. the defect is corrected by having the organ double; easy experiment to be convinced of it, 216; objects at a distance are rarely equal in both eyes; the best eye sees objects largest; infants, having their eyes less, must see objects smaller in proportion, when we look at an object extremely brilliant, vision becomes indistinct, and why; how far the eye can accommodate itself to darkness, 220; remarkable instance of it in a major under King Charles the First, 220; whence have arisen the small eyes of the Tartars and Chinese, 249; Eastern poets compare the eyes of their mistresses to those of the gazelle; the Greeks resemble the eyes of a beautiful woman to those of a cow, ii. 53; of all animals, natives of this climate, none have an eye so beautiful as the stag, 64; that of the wolf opens slantingly upwards in the same direction with the nose, 140; of the fox placed obliquely, like those of the wolf, 147; of the civet shine in the night; those of the hare placed backwards, to see behind it as it runs, and these are never wholly closed; peculiar advantages of the smallness of the eye in the mole, 214; description of the eyes of birds of the owl kind; in the eyes of all animals, a complete provision to shut out too much light, or to admit a sufficiency, by contraction and dilatation of the pupil, iii. 79; those of the great Greenland whale not larger than those of an ox, 245; of the snail on the points of its largest horns, iv. 30; peculiarities in the eyes of the chamelion, 77; eyes of the butterfly have not all the same form; the outward coat has a lustre displaying the various colours of the rainbow; examined a little closely, it will be found to have the appearance of a multiplying-glass, 165; the beetle, in its worm state, has no eyes, 199.

Eye-brows, joining in the middle, considered a peculiar grace by Tibullus, and by the Persians, i. 188; Le Brun's directions regarding the passions, place the principal expression in them; such as have them most at command are the best actors, 192; the Talapoins of Siam shave the eye-brows of the children committed to their care, 196.

Eye-lashes, men and apes only have them upon the upper and lower lids, all other animals want them on the lower lid, i. 192.

Eye-lids, in birds and amphibious quadrupeds, the lower lid alone has motion; fishes and insects have no eye-lids, i. 192.

Face, its form the result of custom, i. 249. See *Beauty*, i. 259.

Falcon-gentil, a kind of hawk; it pursues the gazelles, ii. 57; many people admire its flesh, and dress it for eating, says Belonius, iii. 60; method of training up this bird; falconry, much disused among us, was a principal amusement of our ancestors; the falcon-gentil and the peregrine much less than the gyr-falcon, which exceeds all others in largeness; description of the gyr-falcon; a courageous and fierce bird, not fearing the eagle; it chiefly flies at the stork, the heron, and the crane; is chiefly found in the northern regions, but loses neither strength nor courage when brought into the milder climates; the falcon-gentil moults in March and sooner; the peregrine does not moult till August; the common falcon is of such spirit, that, like a conqueror in a country, he keeps all in awe and subjection to his prowess; young falcons, though depressed by captivity, will, when brought out, fly at barnacles and wild geese; the falcon's pursuit of the heron, kite, or woodlark, the most delightful sport; names of the falcons in use here and in other countries; among the Welch, the king's falconer the fourth officer of the state, was forbid to take more than three draughts of beer from his horn, lest he should neglect his duty, 71 to 75.

Falconers, catch the kite for the purposes of training the falcon, and how, iii. 81, 82.

Fallopius, the two tubular vessels perceived by him, i. 167.

Famine supported by carnivorous animals for several weeks together, i. 281.

Fat of the shamois, its medicinal virtue; fat of animals found efficacious in some disorders, ii. 51; of the manati, exposed to the sun, has a fine smell and taste, and exceeds the fat of any sea-animal; the heat of the sun will not spoil it, nor make it rancid; several other qualities of this fat, ii. 248.

Father-lasher, description of this fish, iii. 286.

Fawn, name of the buck and the doe the first year, ii. 73.

Feathers of birds described, iii. 29; of the ostrich almost as soft as down, 46; different uses made of goose feathers, 219, 220.

Feather-beds utterly unknown in countries bordering on the Levant, and all Asia; ancients did not use feather-beds; Pliny speaks of bolsters of feathers for their heads; feathers make a considerable article of commerce; different qualities; best method of curing them; old feathers more valuable than new, iii. 219, 220.

Fecundity of the rabbit greater than of the hare, ii. 184.

Feeling, deprived of feeling, our eyes would misrepresent the situation and the number of all things around us, i. 215; blind men have this sense finer than others, and why; the grossest and most useful of the senses; no total deprivation of it but with life; those parts most exercised in it, require the greatest accuracy; the fingers by habit, greater in the art than others, not from their having more nerves; fishes having no organs for feeling, must be the most stupid of all animals; feeling, the guardian, the judge, and the examiner of all the senses, is never found to deceive, 229, 230.

Ferret has eyes of a red colour, i. 191; not found at present here, but in the domestic state; its description; a native of the torrid zone; naturally such an enemy of the rabbit, that a young ferret, although unacquainted with the kind, will fiercely attack and bite even a dead one; use of ferrets in warrens to enter the holes muzzled, and drive the rabbits into the nets at the mouth; to bring the ferret from his hole, straw and other substances burnt at the mouth; the female less than the male, whom she seeks with great ardour, and often dies without being admitted; they sleep almost continually, and the instant they awake seem eager for food; are usually fed with bread and milk; breed twice a-year; some devour their young as soon as brought forth, and then become fit for the male again; the litter usually from five to six young, and these consist of more females than males; its scent fœtid; has attacked and killed children in the cradle; is easily irritated, and then smells more offensively; its bite difficult of cure; has eight grinding teeth; to the ferret kind may be added an animal called by Mr. Buffon, the vansire, ii. 160, 161; comes originally from Africa, 186.

Fever, opinion that the lion is in a continual fever, ii. 109.

Feumet, name of the excrement of the stag, ii. 67.

Fibres, muscular, compose the stomachs of insects, ii. 29.

Fieldfare, bird of the sparrow kind, iii. 142.

Fielding. See *Smile*.

Figure, little known exactly of the proportion of the human figure, i. 200; different opinions concerning it, 201; whence proceed the variations in the human figure, 249; the oldest measure of the human figure in the monument of Cheops, in the first pyramid of Egypt, 259.

Finder, a dog of the generous kind, ii. 132.

Fins, different purposes they answer in fishes, iii. 230, 231, those of the whale; their use, 244, 245, 246.

Fin-fish, iii. 244; its food, 247.

Fingers, by habit, and not from a greater number of nerves, become exacter in the art of feeling than any other part, even where sensation is more delicate and fine, i. 229.

Fire, perpetual in the kingdom of Persia, i. 41; advantages arising from the subterranean fires, 55; put out by the sun shining upon it, and why, 134; fleeting balls of fire, 151; great globe of fire seen at Bononia in Italy, not less than a mile long, and half a mile broad, 152; lighted to preserve herds and flocks from animals of the cat kind, ii. 109.

Fireflare, Pliny, Ælian, and Oppian, supply the weapon of this fish with a venom affecting even the inanimate creation; reasons to doubt of it, iii. 268, 269.

Fishes, petrified, found in the mountains of Castravan, i. 25; fish in abundance found in a new formed island; those who eat of them die shortly after, 56; cannot live in water whence the air is exhausted, 128; showers of fishes raised in the air by tempests, 156; most of them produced from the egg; have no eye-lids at all, 192; nor any neck, 198; are allured by music, 223; having no organs for feeling, must be stupid, 230; ruminating sort, ii. 28; opinion, that all fish are naturally of the salt element, and have mounted up into fresh water by accidental migration; some swim up rivers to deposit their spawn; of which the size is enormous, and the shoals endless; all keep to the sea, and would expire in fresh water; the number to which names are given, and of the figure of which something is known, according to Linnæus, are above four hundred; their pursuits, migrations, societies, antipathies, pleasures, times of gestation, and manner of bringing forth, are all hidden in the turbulent element that protects them; the history of fishes can have little in it entertaining; for instead of studying their nature, pains have been taken to increase their catalogues; that shape granted to most fishes, is imitated to such vessels as are designed to sail with the greatest swiftness; any large fish overtakes a ship in full sail, with great ease; the chief instruments in the motion of a fish are the fins; in some they are more numerous than in others; it is not always the fish with the greatest number of fins that has the swiftest motion; how the fins assist the fish in rising or sinking, in turning or leaping out of the water; all this explained by the experiment of a carp put into a large vessel; all fishes covered with a slimy glutinous matter, that defends their bodies from the immediate contact of the surrounding fluid; they fall behind terrestrial animals in their sensations; their sense of touching and smelling; their sense of tasting; hearing is found still more imperfect, if found at all; Mr. Gouan's experiment to this purpose; from it is learned they are deaf as mute; their sense of seeing; their brain; they capacity insatiable; when out of water, and almost expiring, they greedily swallow the bait by which they were allured to destruction; the maw placed next the mouth, and though possessed of no sensible heat, is endued with a faculty of digestion, contrary to the system, that the heat of the stomach is alone sufficient for digestion; though for ever prowling, can suffer want of food very long; instances of it; life of a fish but one scene of hostility, violence, and evasion; the causes of animal migrations; all stand in need of air for support; those of the whale kind come to the surface of the sea every two or three minutes to breathe fresh air; experiment of a carp in a large vase of water, placed under an air-pump; general method of explaining respiration in fishes; the description and uses of their air-bladder; full play of the gills prevented, or the bony covers kept from moving, the animal would fall into convulsions, and die, iii. 229 to 237; some fishes have no air bladder; can live but a few minutes without air; nothing more difficult to account for than the manner of getting this supply; no part of the account of the use of the air-bladder well supported; Bacon's observations upon their growth and age; two methods for determining the age of fishes, more ingenious than certain; a carp found to be a hundred years old; the discovery confirmed by authors; longevity of these animals, nothing compared to their fecundity; some multiply by millions; some bring forth their young alive, and some produce eggs; the former rather the least fruitful; the viviparous blenny brings forth two or three hundred at a time, all alive, and playing together round the parent; different seasons for depositing spawn; some fishes have the tenderness of birds or quadrupeds for their young; their copulation as yet a doubt; the flesh of fishes; question to the learned concerning the flesh of fishes; cetaceous fishes, 237 to 241; cartilaginous fishes, 258; sucking fish sticks to the shark; called the shark's pilot, and why, 263; all fish more delicate about a baited hook than their ordinary food, 265; best bait for all is fresh herring cut in pieces of a proper size; experience shows, the larger fish take a living small one upon the hook sooner than any other bait, 267; more than those of the ray kind possessed of the numbing quality; Condamine informs us of a fish with the powers of the torpedo, and resembling a lamprey; lamprey of the English Severn the most delicate fish whatever, 271; *sun-fish* described, 278; *lump-fish*, 279; *pipe-fish*, 279; *galley-fish*, 281; spinous fishes, 284; Mr. Gouan's system of spinous fishes, 284 to 289; use of it; all fish of the same kinds have the same number of bones; the small lean, and with many fins, the most bony; vulgar expression, that fishes at some seasons are more bony than at others, scarce deserves contradiction; none imbibe the sea-saltness with their food, or respiration; whence then do some fishes live there, and quickly expire in fresh water; some tribes live only in the sea; others only in fresh water; some part of the season in one, and a part in the other, as the salmon, the shad, the smelt, and the flounder; some fish, as the eel, descend the fresh water stream, to bring forth their young in the sea; in what season; long voyages undertaken by some tribes that constantly reside in the ocean, and may be called the fish of passage; stated returns, and regular progress of those fish of passage the most extraordinary circumstances in the history of Nature; names of several migrating fishes; of all such, the herring and pilchard take the most adventurous voyages; places where found in abundance, 289 to 293; in the islands of the Indian Ocean, an over-quantity, in shoals on the swamps, dried up by the sun; the putrefaction renders the country unhealthful; amazing propagation along our coasts and rivers not proportionate to the quantities among the islands of the Indian Ocean; places where the spawn is deposited; doubts whether most fish come from the egg completely formed; manner in which the eggs of fishes are impregnated wholly unknown; growth of fishes; instance in the growth of mackarel; all live upon each other, in some state of their existence; of those in the ocean of the spinous kinds, the dorado the most voracious; flying-fish chiefly sought by the dorado; their warfare; opinion that all fishes are natives of the sea, founded upon their superior fecundity of breeding twenty to one; certainly fresh water fishes abate of their courage and rapacity; greediness of the sea-fish to devour the bait prodigious compared with the manner it is taken in fresh water; difference of bait with which they are caught; some fishes rendered so torpid in the northern rivers, as to be frozen up in the masses of ice, and continue there several months, seemingly without life or sensation, waiting the approach of a warmer sun to invite them to life and liberty; each species of fish infested with worms of different kinds; most vivacious animals; often live upon substances poisonous to the more perfect classes of animated nature; numbers of fishes making poisonous wounds, scarcely to be doubted; some fishes being poisonous is notorious; the cause inscrutable; Dr. Grainger, after residing many years at St. Christopher's, affirms, that of fish caught at one end of the island, some were good and wholesome, while others of the same kind, taken at a different end, were dangerous, and commonly fatal; the Philosophical Transactions give an account of poisonous qualities of fish at New Providence all kinds, at different times, alike dangerous; the same species this day serving as nourishment, the next found fatal; speculations and conjectures to which these poisonous qualities have given rise, 296 to 301.

File-fish, most wonderful of the shelly tribe, iv. 45. See *Pholades*.

Fishery of pearls, several; chiefly carried on in the Persian Gulf, iv. 42; the peopel destined for the pearl fisheries; they die consumptive; in what manner they fish for pearls, 43, 44.

Fishing-frog, from its deformity called the *sea-devil;* conceit that this fish uses its two long beards or filaments for fishing; Rondelet says, that the bowels taken out, the body appears transparent; and with a lighted candle in it, has a formidable appearance; fishermen have a great regard for this ugly fish, as an enemy to the dog-fish; when taken they set it at liberty, iii. 278, 279.

Fissures, perpendicular, found in every field and every quarry; their causes, i. 31.

Fistularia, description of this fish. iii. 238.

Flame will burn under water; none found continuing to burn without air. i. 134.

Flamingo, the most remarkable of the crane kind, the tallest, bulkiest, and most beautiful; its description; chiefly found in America; once known on all the coasts of Europe; in deserted regions, the flamingoes live in a state of society, and under a better polity than others of the feathered creation; delicacy of its flesh; when the first Europeans in America killed one, the rest regarded the fall in fixed astonishment; thus the fowler levelled the flock, before any began to escape; it is now one of the scarcest and shyest birds in the world; places it chiefly inhabits; always appoints one as a watch, who gives notice of danger with a voice shrill as a trumpet; Negroes fond of their company, and think their society a gift of heaven, and protection from evils; these killed hidden in the long grass, to prevent ill-treatment from the blacks discovering the murder of their sacred birds; are frequently taken with nets; refuse all nourishment when taken; pine and die, if left to themselves in captivity; its tongue is the most celebrated delicacy; a dish of them, says Labat, is a feast for an emperor; a Roman emperor had fifteen hundred flamingo's tongues served up in a dish; their tongue larger than that of any other bird; its flesh; they move in rank like cranes; appear in flight of a bright red as a burning coal; manner of feeding very singular; savages of Canada call it *tococo*, and why; time of breeding, and their nests; number of their eggs; colour when young; they become familiar in five or six days, eat out of the hand, and drink sea-water; but generally pine away, wanting their natural supplies, and die in a short time; savages make ornaments of their plumes; and the skin sometimes serves the Europeans to make muffs, iii. 177 to 180.

Flea, persecutes the hare, ii. 182; it can draw a chain a hundred times heavier than itself, and eat ten times its own size of provisions in one day, iv. 110; its description, 117; aborescent water-flea, or monoculus, described, 124; Leuwenhoeck has discovered above six thousand facets on the cornea of a flea, 164.

Flemings, possessed the art of cloth-working in a superior degree; were invited to settle here. ii. 42.

Flesh dries at Cusco like wood, without corrupting, i. 262; the Persians esteem that of the wild ass so highly, that its delicacy is a proverb among them, ii. 18; of the fallow-deer preferred to any other, 72; of the roebuck between one and two years old, allowed the greatest delicacy known, 77; of the tiger is good for food, some hold it superior to mutton, 119; of dogs sold in shambles all over China; and the Negroes of the coast of Guinea esteem it a delicacy; as likewise that of toads, lizards, and tigers, 137; that of the wolf very indifferent; no creature known to eat it but the wolf himself, 146; of the squash, tolerable food, 168; that of the glutton not fit to be eaten, 175; of the hare religiously abstained from by the Jews, ancient Britons, and Mahometans, 183; of the paca considered a great delicacy, 198; of the tendrac thought by the Indians a great delicacy, 218; of the pangolin considered a very great delicacy by the Negroes of Africa, 224; of the armadillo, or tatou, said to be delicate eating, 226; of the seal formerly found place at the tables of the great, 246; of the Monkey liked by the Negroes, 263; of the ostrich proscribed in scripture unfit to be eaten. iii. 47; of the emu, or the American ostrich, good to be eaten, 52; of the dodo, good and wholesome eating, 56; of the vulture, falcon, and osprey, when young, excellent food, according to Belonius; that of carnivorous birds stringy and ill-tasted, soon corrupting, and tinctured with that animal food upon which they subsist, 59; of the bird condor as disagreeable as carrion, 65; of the peacock, keeps unputrefied longer than of any other animal, 91; of the pheasant, considered as the greatest dainty, 96; of the quail, a very great delicacy, 106; that of the partridge so valued by the French, according to Willoughby, that no feast could be complete without it, 103; of the toucan tender and nourishing, 117; of the young herons in particular estimation in France, 172; of the bittern greatly esteemed among the luxurious, 175; of the puffin, formerly by the church allowed on lenten days, 212; of fishes yield little nourishment; questions proposed to the learned concerning it, 240; of the young porpoise said to be as well tasted as veal, 257; of the shark hardly digestible by any but Negroes, who are fond of it to distraction, 264; of the turtle is become a branch of commerce, iv. 20; that of some crabs is poisonous, 12; of the great Mediterranean turtle sometimes poisonous, 18.

Flies torment the elephant unceasingly; arts the elephant tries to keep them off, ii 278; dragon-fly, or the libella, iv. 133; common water-fly swims on its back, 149; the cornea so adapted by Puget, as to see objects through it with a microscope; strangeness of its representations; does the fly see objects singly, as with one eye, or is every facet a complete eye, exhibiting its objects distinct from the rest? 165· the Spanish fly, iv. 202. See *Cantharides*.

Flintshire, in a lead mine there, two great grinding teeth, and part of the tusk of an elephant, discovered at the depth of forty-two yards, ii. 284.

Flounder, known to produce in one season above one million of eggs, iii. 238.

Fluids, ascending in vessels emptied of air; rising in capillary tubes, and how this comes to pass, i. 81.

Flumide, description of this fish, iii. 287.

Flux of the sea, i. 103; not equal in the Straits of Magellan, 106.

Fly-catcher, bird of the sparrow kind, iii. 143.

Flying-fish, its description, iii. 288; chiefly sought by the dorado, 298.

Fly-trap, name of a flower, closing upon the flies that light upon it, iv. 209.

Fœtus, the canal of communication through which the blood circulates in the fœtus, without going through the lungs, has been found open in some bodies that have been dissected. iv. 43.

Fongwang, natives of China give a fantastic description of this imaginary bird, iii. 98.

Fontenelle, a celebrated writer, of a weak and delicate habit of body; the remarkable equality of his temper lengthened out his life to above a hundred; nothing could vex or make him uneasy, i. 235, 236.

Food, man can live without it for seven days, a Scotchman for the space of six weeks took no food at all, i. 209.

Foot, hares have the sole of it furnished with hair, ii. 179. See *Hare* and *Hair*.

Foramen ovale, opening in the heart of the fœtus, i. 177; in the seal's heart never closes, ii. 242.

Forbin (*Chevalier*,) his account of baboons forcing women in Siam, ii. 257.

Forehead, narrow, liked by the Romans, i. 188.

Forest, generally divided between monkeys and serpents, ii. 262.

Formica-leo, the *lion-ant*, described; its habits; its retreat; contrivances for catching other insects; when attaining a certain age changes its form; description when become a large and beautiful fly of the libellula kind, iv. 135 to 137.

Fossil, teeth of elephants often found in that state, ii. 284; bones found in Peru and Brazil, 285; shells in the bowels of the earth, not found in the ocean, iv. 28.

Fouine, animal of the weasel kind, ii. 163.

Fowls, large do not rise easily, and why, iii. 30; few water-fowls known to breed in England, and why, 39; those of reddish plumage the ancients held invaluable; the white, as unfit for domestic purposes and fit as prey to rapacious birds; Aristotle thinks them less fruitful than the former, 87; sea-fowls ever sporting on formidable sea-coasts, 203; general characteristics of water-fowls; their food; the gull kind; the penguin kind; the goose kind, 190 to 192; water-fowls properly of no climate, 213.

Foxes, hunt in packs, ii. 128; their cubs born blind, like those of the dog; the fox lives about twelve or fourteen years; remarkable instance of parental affection of a she fox; all animals make war upon the fox, even the birds; refuses to engender with the dog; brings forth fewer than the dog, and but once a year; the female goes with young six weeks, and seldom stirs out while pregnant; various colours of them; three varieties of this animal in Great Britain; grey-hound fox, mastiff fox, and cur fox; round the pole they are all colours; jackal taken for the fox; skin of the black fox most esteemed, a single skin selling for forty or fifty crowns, 148 to 150; in Greenland do not change colour at all, 159; taken young are gentle only while cubs, growing older, discover their natural appetites of rapine and cruelty, 129; nothing eatable comes amiss to them, rats, mice, serpents, toads, lizards, insects, crabs, shrimps, shell-fish. carrots, wax, honey, and even the hedgehog, 148; chase of the fox; their offensive smell often the cause of their death; way they find to subsist; name given by huntsmen to a fox of the second year; old fox the name for the third year, 146 to 148; many animals in this country bred between a dog and a fox; experiments prove neither the wolf nor the fox of the same nature with the dog, each a species perfectly distinct, 157; exactly resembles the wolf and the dog internally 145;

description; eyes obliquely situated like the wolf. 147; often takes possession of the hole quitted by the badger, or forces it from its retreat by art, iii. 15.

Fox (crost.) name of the isatis, when turning white, ii. 152.

Fox-tailed monkey, of the sagoin kind, ii. 268.

France, its kings of the first race had whiskers knotted and buttoned with gold, i 196; under Francis I. peacocks served up at the tables of the great, not to be eaten but seen, iii. 91.

Fray, said when stags rub off the peel of their horns against trees, ii. 68.

Frederick, emperor of Germany, wrote a treatise upon hawking, iii. 71.

Friczeland, great inundations happened in it, i. 113.

Frieschaff, a lake where the sturgeon is found in great numbers, iii. 275.

Frog, designedly introduced into Ireland before the Norway rat, ii. 203; the rat put a stop to their increase, and the frog is almost extinct in that kingdom, 204; differences between it and the toad, in figure and conformation; the frog the best swimmer of all four-footed animals; its description; male or female have no external instruments of generation; the anus serving for that purpose in both; coupling of the common brown frog; experiments to discover how their impregnation is performed; the female not impregnated by the mouth, as conjectured, nor by the thumbs, as imagined by Linnæus, but by inspersion of male seminal fluid upon the eggs proceeding from the body; how the female brings forth eggs; various changes in the eggs after impregnation by the male; the animal in its perfect state, from feeding upon vegetables, becomes carnivorous, lives upon worms and insects, and seeks for food upon land; myriads seen on such occasions, have been fancied to be generated in the clouds, and showered down on earth; their habitudes and food; differences of sexes not perceivable, until their fourth year; do not begin to propagate till that period; live about twelve years; a German surgeon kept one eight years in a glass covered with a net, fed it often but sparingly; instances of tenaciousness of life; the male only croaks; large water frog's note as loud as the bellowing of a bull, and heard at three miles distance; times of their croaking; no weather glass so true in foretelling changes; adhere to the backs of fishes; story of Walton to this purpose; dry weather hurtful to frogs, 49 to 54. See *Fishing-frog*.

Frost, dry, augments evaporation, i. 148.

Frost-smoke, fogs near the Pole form halos, or luminous circles, i. 154.

Froth-worm, its description, iv. 148.

Fumes of hot iron, copper, or other metal, blown into the place where an animal is confined, instantly destroys it, i. 128.

Fur, the colder the country, the larger and the warmer the fur; instances of it, i. 283; of the white fox not esteemed, and why, ii. 150; the isatis of no value, unless killed in winter, 153; the ermine the most valuable of any, 158; no easy matter to account for warmth of furs of northern quadrupeds, or how they come to have such abundant covering; particulars on this subject, 158; white weasel, found in Great Britain, of no value; ermine in every country changes by time, 160; of the pole-cat in less estimation than some of inferior kinds, 162; of the yellow-breasted martin more valuable and beautiful than the white, 163; different colours of the sable, 165; of the genet valuable, 170; of the civet impregnated with the perfume, 171; of the glutton has the most beautiful lustre, and is preferred to all except the Siberian sable, 175; of the hare forms a considerable article in the hat manufacture, 182; of the cricetus, or German rat, very valuable, 210; inside down of the vulture's wing makes a warm and comfortable kind of fur, ii. 64.

G.

Gadfly, formidable in Lapland; brings on an incurable disorder upon the rein deer, precautions used against them, ii. 84.

Gadus, the cod-fish, its description, iii. 287.

Galam, a place nine hundred miles up the Senegal, taken from the French, i. 88.

Galen asserts the eggs of hens and pheasants good to be eaten, those of geese and ostriches worst of all, iii. 50.

Galinassos, Spanish name of vultures in America, iii. 70.

Gall of the shamois held useful to strengthen the sight, ii. 52; the deer kind have none, 60.

Gall-nuts, description of the insect forming and residing in them, and its transformations, iv. 204.

Galley-fish, its description; its legs adhesive; common in America, perpetually floating; no efforts made to hurt, can make it sink; never perceived to move on shore, so strongly adhering to whatever substances applied; the smallest quantity of slimy substance from its legs, burns the skin like hot oil; the shore covered with them, a forerunner of a storm. iii. 281

Galley-worm, its difference from the scolopendra, iv. 129.

Game, sanguinary laws to preserve it, ii. 66.

Ganges, a river visited annually by a hundred thousand pilgrims, who pay their devotions to it as to God, i. 88; in its course receives twenty rivers, 91.

Gannet, the soland goose, its description; subsists upon fish; places abounding with them; manner of preserving them and their eggs, in the island of St. Kilda; twenty-three thousand of this kind of young birds consumed annually there; a bird of passage; its migrations; never comes near the land; where seen, it announces the arrival of herrings; exceeds the cormorant in quickness of sight; method of taking its prey; manner of taking them at sea; number of their eggs; their young counted a great dainty, and sold very dear, iii. 199 to 201.

Garter-fish, the lipidopus, its description, iii. 287.

Gasterosteus, or the stickleback, description of this fish, iii. 286.

Gazelles, neither goat nor deer; partake of both natures; they form a distinct kind; their description; of all animals it has the most beautiful eye; Eastern poets compare the eyes of their mistresses to those of the gazelle; Buffon makes but twelve varieties; their names and descriptions; comparing them together, we find but slight distinctions; are inhabitants of the warmer climates; no animals, but of the winged kind, can overtake them; are pursued by falcons, and this hunting is a principal amusement among the great in the East; also hunted with the ounce; another way of taking them; keep in solitary and inaccessible places, ii. 52 to 58; the bubalus, more properly one of Africa, 80; the most usual prey for the lion, in deserts and forests, 109; the prey of the panther, 123; pursued by the jackal, makes towards houses and towns, 151.

Gekko, a kind of salamander, iv. 71.

Generation most complete where fewest animals are produced, i. 178; late discovery that male fishes have two organs of generation, iii. 239; all animals of the snail kind are hermaphrodites; each containing the instruments of generation double, iv. 33; these organs in the muscle, 37; male or female frogs have no external instruments for that use, 49.

Genet, its odour more faint than civet; description of this animal; resembles the martin; more easily tamed; Belonious has seen them at Constantinople tame as cats, glands open differently from others of its kind; called the cat of Constantinople; never found in mountains or dry places; its fur valuable; species not much diffused; countries where it is found; the most beautiful, cleanly, and industrious animal; keeps a house free from mice and rats by its smell, ii. 165, 166.

Genet, of the province of Andalusia the best, ii. 10.

Georgians, their description, i. 246.

Gerbua, has four feet, uses only the hinder in running or resting; the swiftest creature in the world; description; countries where found; lives upon vegetables, and burrows like rabbits, iii. 23, 24.

Gerenda, a serpent to which the natives of Calicut and those of the Mozambique coast pay divine honours, iv. 102.

Germany, the meanest peasant kills a cow for his table, salts and hangs it up, and preserves it as a delicacy all the year round, ii. 31.

Gesner, minutely describes a variety of mouse-traps, ii. 205; places bats among birds, ii. 229

Giant, in England, as late as King James I. the court had one, i. 254.

Giants, probability of the race affirmed, possibility of their existence denied; Grew's opinion; Ferdinand Magellan, a Portuguese, first discovered a race of such people, towards the extreme coast of South America; assent to the existence of this gigantic race of mankind; travellers confirm it; seen here, have the same defects of understanding as dwarfs; are heavy, phlegmatic, stupid, and inclined to sadness, i. 256 to 258.

Gibbon, the long armed ape, its description, ii. 256, 257.

Gills, their free play prevented, the animal falls into convulsions and dies, iii. 235.

Gilthead, called dolphin by sailors; its description, iii. 284.

Gimmero, imagined a breed between an ass and a bull, ii. 21.

Glands, furnish the fœtid substances in animals of the weasel kind, ii. 157; of the genet open differently from others, 155; unctuous in birds to preserve their feathers, iii. 28; salivary in the gullet and crop of birds, 32.

Glass, a looking-glass held to the mouth of a person supposed to be dead, an uncertain experiment for determining latent life, i. 238.

Glitters, little impressions so called in the heads of stags, ii. 68.

Globe of fire rising from the side of the mountain Pichinca, a great one seen at Bononia, in Italy, in the year 1676; past westward at the rate of a hundred and sixty miles in a minute; could not be less than a mile long, and half a mile broad, i. 152

Globe of Glass, filled with water, assumes successively all the colours of the rainbow, i. 154.

Gloucester, its corporation had an old custom annually to present the king with a lamprey pie, iii. 273.

Glow-worm, male and female of this species differ entirely from each other; how and in what manner in which light sent forth by the glow-worm is produced, hitherto inexplicable; the light continues to grow paler, and at last is totally extinct, if the worm be kept for some time, iv. 201, 202.

Glue, made of the horns of the rein-deer, ii. 87; Mr. Jackson found out a method of making glue to answer the purpose of isinglass, iii. 277.

Glutton, the most dangerous and most successful persecutor of the rein-deer; its manner of killing that deer, ii. 88; belongs to the weasel kind; there is no precise description of it, some resembling it to a badger, some to a fox, others to a hyæna: one brought alive from Siberia, was three feet long, and about a foot and a half high: so called from its voracious appetite; countries where found; called carcajou in North America; general description; Ray and others doubt of its existence; takes its prey by surprise, and in what manner; darts down from the branches of trees upon the elk or the rein-deer, sticks its claws between their shoulders, and remains there firm, eating their necks, and digging to the great blood vessels that lie on that part; amazing quantity one of these animals can eat at a time; that seen by Mr. Klein, without exercise or air, taken from its native climate, and enjoying but indifferent health, ate thirteen pounds of flesh every day, and was not satisfied; it continues eating and sleeping till its prey, bones and all, be devoured; prefers putrid flesh to that newly killed; it is so slow that any quadruped can escape it, except the beaver; pursues it upon land, but the beaver taking water, the glutton has no chance to succeed; called the vulture of the quadrupeds; in what manner it makes up by stratagem the defects of nature; the female goes with young four months, and brings forth two or three; the male and female equally resolute in defence of their young; is difficult to be skinned; does not fear man; is a solitary animal, and never in company but with its female; couples in the midst of winter; the flesh not fit to be eaten; the fur has the most beautiful lustre, and preferred to all, except the Siberian fox, or the sable, ii. 172 to 177.

Gnats in Lapland, fill the air like clouds of dust; are chiefly enemies to the rein-deer; remedies used against them, ii 93; proceed from a little worm, usually seen at the bottom of standing waters; curious manner in which the eggs are laid; in their egg state resembles a buoy, fixed by an anchor; different states of the insect; in its last transformation divested of a second skin, in the next it resigns its eyes, its antennæ, and its tail, and seems to expire; from the spoils of the amphibious animal appears a little winged insect, whose structure is an object of admiration; description of this insect, and of its trunk, justly deemed one of Nature's master-pieces; implement with which the gnat performs its work in summer; places where it spends the winter; the little brood so numerous that the water is tinged with the colour of the species; some gnats oviparous, others viviparous, and come forth in a perfect form; some are males, and unite with the female; some are females, requiring the male; others are of neither sex, and produce young without copulation; at the sixth generation their propagation stops, the gnat no longer reproduces its likeness, but requires the male to renew its fecundity; produced in multitudes beyond expression in America; and found of all sizes, from six inches long, to a minuteness beyond the perception of the common eye; native Indians, anointed with oil, sleep in cottages covered with thousands of gnats, and have not their slumbers interrupted by these cruel devourers, iv. 205 to 208.

Goat, its eyes are gray, i. 191; from Europe imported into South America, soon degenerates; as it grows less, it becomes more prolific; imported to the African coast, it seems to improve, i. 285; goat and sheep propagate together, and may be considered as of one family; the buck-goat produces with the ewe an animal, in two or three generations returning to the sheep, and retaining no marks of its ancient progenitor, ii. 39; more fitted for a life of savage liberty than the sheep; it is not easily confined to its flock, but chooses its own pasture, and loves to stray from the rest; delights in climbing precipices; is capricious and vagrant; is not terrified at storms, or incommoded by rain; immoderate cold affects it, and produces a vertigo, to which this animal is subject; proof of its being naturally the friend of man, and that it seldom resumes its forest wildness, when once reduced into the state of servitude; in some places they bear twice a-year; in warmer climates generally bring forth three, four, and five at once; milk of goats medicinal; not apt to curdle on the stomach; flesh of the goat, properly prepared, ranked by some not inferior to venison; is never so good and so sweet in our climate as mutton; no man can attend above fifty goats at a time; flesh of the goat found to improve between the tropics; remarkable varieties in this kind; that of Natolia, by Mr. Buffon called *goat of Angora;* its description. the *Assyrian goat* of Gesner; chiefly kept about Aleppo; *little goat of America*, the size of a kid, has hair as long as the ordinary breed; *Juda goat*, not larger than a hare; common in Guinea, Angola, and the coast of Africa; *blue goat*, at the Cape of Good Hope; its description, 45 to 48; boundaries between the goat and deer kind difficult to fix, 52; *Bezoar goat*, the *pasun*, found in the mountains of Egypt, &c. 54; *African wild goat* of Grimmius, fourth anomalous of the kind; its description, 56; goats eat four hundred and forty-nine plants, and reject a hundred and twenty-six, 91; in Syria, remarkable for their fine, glossy, long, soft hair, 105.

Goat-sucker, a nocturnal swallow; description and habits, iii. 153.

Gobius, the gudgeon, description of this fish, iii. 285.

Godignus, in his history of Abyssinia, exaggerates the effects of the shock of the torpedo, to an incredible degree, iii. 271.

Godwit, its dimensions, iii. 182; a bird of passage, 113.

Goiam, a kingdom, where the Nile takes its rise, i. 20.

Gold never contracts rust, and why; except in places where much salt is used, i. 127.

Golden-eye, bird of the duck kind, iii. 221.

Goldfinch, bird of the sparrow kind, iii. 141; learns a song from the nightingale, 153.

Goose, marks of the goose kind; abstained from by the ancients as indigestible, iii. 213, 214; one known to live a hundred years; marks of the tame and wild sort; wild supposed to breed in the northern parts of Europe; flight regularly arranged, 218.

Goose (*Brent*,) most harmless, but for their young pursue dogs and men; use of its feathers in beds unknown in countries of the Levant and Asia; feathers a considerable article of commerce; different qualities of them; the best method of curing them, 219, 220.

Goose (*Soland*,) described. See *Gannet*, iii. 200.

Gooseander, a round-billed water-fowl, its description; feeds upon fish, iii. 213.

Gordian, the emperor, wrote a poem upon the halcyon, of which are no remains, iii. 226.

Goss-hawk, of the baser race of hawks, iii. 72; taught to fly at game; little obtained from its efforts, 76.

Gottenburgh, in Sweden, a cataract near it, i. 92.

Gouan, a learned Frenchman, his system deserves applause for more than its novelty; how followed in arranging the spinous class of fishes, iii. 283.

Graaf, his observations upon the progress and increase of animals in the womb, i. 174.

Grampus, fierce and desperate in defence of its young; remarkable instance, iii. 242; description and habits, 255.

Grasshopper, a ruminating insect, or seemingly so, ii. 28; differences between ours and the cicada of the ancients; great varieties of this animal in shape and colour; description of the little grasshopper that breeds plentifully in meadows, and continues chirping through the summer; the male of this tribe only vocal; how their fecundation is performed; the male or female never survive the winter; their eggs; from first appearing, possessed of wings; how it gets rid of the outer skin; their food; places where they deposit their eggs, iv. 139 to 142.

Grave, the greatest care recommended not to commit those dearest to us to the grave, before real signs of certain death be ascertained, i. 238.

Greta, river in Yorkshire running under ground, and rising again, i. 93.

Grebe, description of the bird; residence and habits; perpetually diving, and very difficult to be shot; never seen on land; chiefly sought for the skin of its breast, and why; in breeding-time their breasts are bare, iii. 188.

Greenfinch, bird of the sparrow kind, iii. 142.

Greenland, Crantz's account of the formation of ice-mountains in that country, i. 101; *aurora borealis*, its appearance almost constant in winter; the inhabitants not entirely forsaken in the midst of their tedious night; this *aurora* affording them light for the purposes of existence, 154; they live mostly upon seals· their number daily diminishing, and why, ii. 246.

Greenlanders, described, i. 240; customary among them to turn Europeans into ridicule; a quiet, or a modest stranger, they deem almost as well bred as a Greenlander, 241.

Grew, his opinion concerning dwarfs and giants, i. 257.

Greyhound kind, ii. 132; greyhound fox, 150.

Gris, the petit gris, Mr. Buffon's name for the grey Virginia squirrel, ii. 187.

Grossbeak, bird of the sparrow kind, iii. 142.

Grotto of Antiparos, in the Archipelago, the most remarkable subterraneous cavern now known; description, i. 33.

Grotto del Cane, near Naples, situation and description; noxious effects, i. 40

Grouse, chiefly found in heathy mountains and piny forests, iii. 100.

Growth of the child less every year, till the time of puberty, when it starts of a sudden; growth of the mind in children corresponds with that of the body, and why, i. 183; of some young people ceases at fourteen or fifteen; of others continues till two or three and twenty, 189; of fishes irregular and tardy, iii. 297.

Guadalquiver, river in Spain buried in sand, i. 93.

Guanacoes, a kind of camel in America, iii. 11.

Guanches, ancient inhabitants of the island of Teneriffe; art of embalming still preserved among them, when the Spaniards conquered the island, i. 261, 262.

Guariba, Brazilian guariba, or warine, the largest of the monkey-kind in America, described, ii. 267.

Guayaquil, river in South America, i. 63.

Gudgeon, fresh water sort, has no bladder, iii. 237; description of that fish, 285.

Guiba, animal resembling the gazelle; its descriprion, ii. 56.

Guillemot, bird of the smaller tribe of the penguin kind, iii. 210.

Guinea, the natives kill numbers of hares at a time, and in what manner, ii. 183.

Guinea-ass, larger and more beautiful than the horse, ii. 21.

Guinea-hen, described, iii. 98.

Guinea-horse, remarkable sports with it among the grandees of that country, ii. 13.

Guinea-pig, by Brisson, placed among the rabbit kind; native of the warmer climates; rendered domestic, and now become common every where; its description, in some places a principal favourite; often displacing the lap-dog; manner of living among us; most helpless and inoffensive, scarce possessed of any courage; their animosity exerted against each other; often fight obstinately, and the stronger destroys the weaker; no natural instinct, the females sees her young destroyed without attempting to protect them; suffer themselves to be devoured by cats; fed upon recent vegetables, they seldom drink; sometimes gnaw clothes, paper, or other things of the kind; drink by lapping; confined in a room, seldom cross the floor, but keep along the wall; never move abreast together; chiefly seek the most intricate retreats, and venture out only when all interruption is removed, like the rabbits, in cold weather more active; a very cleanly animal; their place must be regularly cleaned, and a new bed of hay provided for them once a-week; the young falling into the dirt, or other ways discomposed, the female takes an aversion to them, and never permits them to visit her more; her employment, and that of the male, consists in smoothing their skins, disposing their hair, and improving its gloss; and take this office by turns, do the same to their young, and bite them when refractory; reared without any artificial heat; no keeping them from fire in winter if once permitted to approach it; manner of sleeping; the male and female watch one another by turns; generally capable of coupling at six weeks old; time of their gestation; the female brings forth from three to five at a time; not without pain; the female admits the male the very day she has brought forth, and again becomes pregnant; suckles her young about twelve or fifteen days, and suffers the young of others, though older, to drain her, to the disadvantage of her own; produced with eyes open, and in twelve hours equal to the dam in agility; capable of feeding upon vegetables from the beginning; their disputes for the warmest place, or most agreeable food; manner of fighting; flesh indifferent food; difficultly tamed; suffer no approaches but of the person who breeds them; manner of eating; drink seldom, and make water often; grunt like a young pig; appear to chew the cud, ii. 199 to 201.

Guinea-sheep, have a kind of dewlap under the chin; breed with other sheep, therefore not anmials of another kind, ii. 44.

Guiratemga, name given by the natives of Brazil, to the *little wood-pecker*, iii. 120.

Gull, places where found in plenty; their food, iii. 202.

Gulls, various ways of imposing upon each other; contests in breeding; residence, with their nests and eggs; their flesh; method of taking them in the Feroe islands; anciently a law in Norway concerning those who died in taking them, iii. 203 to 205.

Gulf, the Persian; deadly wind along its coasts, i. 143; chief pearl-fishery carried on their, iv. 42.

Gun, wind-gun, instrument determining the elasticity of the air; a ball from it pierces a thick board, i. 124; great guns, in climates near the equator, with every precaution, after some years become useless, and why, 126.

Gunpowder, readily fires with a spark, not with the flame, i. 39.

Guernard, description of this fish, iii. 286.

Gustavus Adolphus, attempted in vain to form a regiment of Laplanders, i. 24.

Guts, most birds have two blind guts, which in quadrupeds are found single, iii. 33

Gymnotus, the *carapo*, description of this fish, iii. 287.

Gyr falcon exceeds all others in largeness of size; its description, iii. 72.

Gyrle, name given by hunters to the roebuck, the second year, i. 76.

H.

Habit, contracted during life, to make our pleasures and pains in extremes, though either can hardly be suffered or enjoyed to the utmost, i. 228.

Haddock, a periodical shoal appeared on the Yorkshire coasts, on December 10, 1766, and exactly on the same day in the following year, iii. 293.

Hæmorrhois, a kind of serpent, iv. 99.

Hail, Cartesians say, is a frozen cloud half-melted and frozen again in its descent; the most injurious meteor known in our climate; hail-stones fourteen inches round; struck out an eye of a young man, and killed him on the spot; a dreadful shower recorded by Mezeray, fell in 1510; the hail-stones were of a bluish colour, and some weighed a hundred pounds; the fishes were general sufferers in that great calamity, i. 149, 150.

Hair, of the Roman ladies praised for the redness of its shade, i. 188; found most different in different climates; marks the country and the disposition of the man; by the ancients held a sort of excrement, produced like the nails; according to moderns every hair lives, receives nutriment, fills, and distends, like other parts of the body, takes colour from the juices flowing through it; each, viewed with a microscope, consists of five or six lesser, wrapped up in one common covering, and sends forth branches at the joints; suitable to the size or shape of the pore through which it issues; bulbous at the root, and its ends resemble a brush; length and strength of hair a mark of a good constitution; Americans and the Asiatics have it thick, black, straight, and shining; inhabitants of the torrid climates of Africa have it black, short, and woolly; the people of Scandinavia have it red, long, and curled; opinion that every man has dispositions resembling those of the inhabitants of countries he resembles in the colour and nature of his hair; curled hair among us a beauty; the Greeks have taken one of their national distinctions from the length and straightness of the hair; Americans take the greatest pains in cutting their hair; variety in customs and manner of cutting hair, i. 192 to 196; trade of the inhabitants of Angora with the hair of animals of their country; camblet and the other stuffs made of it, ii. 47; hair of the cat, rubbed in the dark, sends forth shining sparks, 103; Syria and Persia noted for long soft hair to the animals bred in them, 105; each hair of the lynx of three different colours; of the black fox so disposed as impossible to tell which way the grain lies, 150; coats of hair seem to thicken at the approach of winter; among quadrupeds, as among men, thin spare diet produces hair, 158; on the soles of the feet, and on the inside of the mouths of hares, 180.

Halcyon, rapacious water-fowl, iii. 226. See *King-fisher*.

Halley, (*Dr.*) his plausible theory to explain the invariable motion of the winds, i. 137, 138.

Hallontide, in 1580, an army of mice so over-run the marshes near Southminster, that they eat up the grass to the roots, iii. 82.

Halos, oftener seen in countries near the poles, than any other part of the earth, i. 154.

Hammer, the yellow, bird of the sparrow kind, iii. 142, 143.

Hamster, the cricetus or German rat of Mr. Buffon, ii. 209.

Hand, sufficient to vindicate the dominion of man over other animals, a poor assertion; a man, without hands or legs, converts his stumps to most convenient purposes, and performs astonishing feats of dexterity, ii. 273.

Harbour of a stag, in covert or thicket, ii. 68.

Hare, a gregarious animal, where it has no enemies but beasts of the forests, ii. 27; the swiftest animal for the time it continues to run, 178; animals of the hare kind inoffensive and timorous; placed by Pyerius among those that chew the cud; whether or not, certainly the lips continually move sleeping or waking; that kind remarkably salacious, and furnished by nature with ampler powers than others for propagation; if not thinned by constant depredations, would over-run the earth; of these, the hare the largest and most timorous; has large prominent eyes placed backwards to see behind as it runs; these never closed; it sleeps with them open; the ears moveable, and capable of direction to every quarter; muscles of its body strong and without fat; hinder feet longer than the fore on account of speed; persecuted by dogs, cats, weasels, and birds of prey; in a state of engendering very early; the female go with young thirty days; produces three or four at a time; has young of different ages in her womb together; though already impregnated, she admits the male, and receives a second impregnation; reason of this extraordinary circumstance; the young brought forth with their eyes open; the dam suckles them twenty days; food they are fond of; sleep or repose in their form by day, and live only by night; the rutting season begins in February; the male pursues and discovers the female by the sagacity of its nose; the slightest breeze, or falling of a leaf, disturbs their revels; they instantly fly off, each taking a separate way; are more easily taken than the fox, a much slower animal than they, and why; always choose to run up a hill, and why; have the sole of the foot furnished with hair, and seem the only animals with hair on the inside of the mouth; live seven or eight years, and come to perfection in one year, females live longer; Mr. Buffon makes a doubt of it; seldom heard to cry, except when seized or wounded; their cry nearly like the squalling of a child; are easily tamed; though never so young, regain their native freedom at the first opportunity; have a good ear, and been taught to beat the drum, dance to measure, and go through the manual exercise; make themselves a form where the colour of the grass resembles that of their skin, open to the south in winter, and to the north in summer; sore hunted, will start a fresh hare and squat in its form; some enter holes like the rabbit, by hunters termed going to vault; as it tires, treads heavier, and its scent is stronger; young hares tread heavier than old; male makes doublings of greater compass than the female; divided by hunters into mountain and measled hares; mode of expression, the more you hunt, the more hares you shall have, and why; what animals persecute the hare; its enemies so various, that it seldom reaches the short term limited to it by Nature; in countries near the north pole, they become white, and are often in great troops of four or five hundred; their skins sold for less than seven shillings a hundred; the fur known to form a considerable article in the hat manufacture; found also entirely black, in much less quantity than the former; some have been seen with horns, but rarely; those in hot countries smaller than ours; those in Milanese the best in Europe; scarce a country where not found from the torrid zone to the polar circle; natives of Guinea kill numbers at a time; in what manner; the Jews, ancient Britons, and Mahometans all considered it as an unclean animal, and religiously abstained from it; hare and rabbit distinct kinds, refuse to mix with each other; an instance; Apicius shows the manner of dressing a hare in true Roman taste; laws made for the preservation of them, 179 to 184.

Harfang, or great Hudson's Bay owl, the largest of the noctural tribe, iii. 80.

Harlequin, a kind of a dog, ii. 132 to 134.

Harmony of our planetary system, i. 10.

Harold. See *Hawk*, iii. 71.

Harp, the story of Arion's gathering the dolphins about the ship, i. 223.

Harpies, that ancient idea taken from the rousette, or the great bat of Madagascar ii. 232.

Harrier, hound, and beagle, all of the same kind, ii. 131; a dog of the generous kind, 132.

Hart, name of the stag the sixth year, ii. 67.

Hartshorn, and musk, the only medicines of reputation of several procurable from quadrupeds, ii. 52.

Harvey, his opinion about the formation of the incipient animal; altercations against his system, i. 166.

Hatching, nothing exceeds the patience of birds hatching, iii. 36; Mr. Addison's observations to this purpose, 37; the emu very peculiar in the hatching of its young, iii. 51; the crocodile's eggs hatched in the sand, iv. 79.

Hatfield, in Yorkshire, description of one of these spouts called typhons, observed there in 1687, i. 157.

Havannah, in the fortunate expedition which gave us that place, the climate left not a fifth part of the army survivors of the victory, i. 130.

Havfinch, a bird of the sparrow kind, iii. 143.

Hawk-kind, destroy mice, ii. 205; perceives a lark at a distance which neither men nor dogs could spy, iii. 30; distinctive marks from other carnivorous birds, 59; in old paintings, the criterion of nobility; no person of rank stirred without his hawk on his hand; Harold, afterwards king of England, going on an important embassy into Normandy, is drawn in an old bas-relief, embarking with a hawk on his fist, and a dog under his arm; in those days, it was sufficient for noblemen's sons to wind the horn and carry the hawk fair; this diversion in such high esteem among the great all over Europe, that Frederick, Emperor of Germany, wrote a treatise upon hawking; this amusement now much given over in this kingdom, and why; in the reign of James I. Sir Thomas Monson gave a thousand pounds for a cast of hawks; in the reign of Edward III. it was made felony to steal a hawk; to take its eggs was punished by imprisonment for a year and day, with a fine at the king's pleasure; in the reign of Elizabeth, the imprisonment reduced to three months, the offender to lie in prison till he got security for his good behaviour during seven years; in earlier times, the art of gunning was but little used, and the hawk was then valuable for its affording diversion and procuring delicacies for the table not otherwise to be obtained.

distinctive marks of the tribe called the long-winged hawk; their names and description; have attachment to their feeder, and docility the baser race are strangers to; names of hawks of the baser race; those of the generous breed remarkable for courage, swiftness, and docility, in obeying the commands and the signs of their master; account of the manner of training a hawk; falconers had a language peculiar, in which they conversed and wrote, 71 to 73.

Hawk (*sparrow*,) pursues the thrush and the linnet, iii. 58; said to be the boldest and the best of all others for the chase, 76.

Hawk (*goss*,) and sparrow-hawk unfit for training; taught to fly at game, but little obtained from them. iii. 76.

Hawkins, (*Sir Robert.*) See *Azores*, i. 99.

Head of man externally and internally different from that of all other animals, the monkey-kind excepted, i. 198; whence originally the flat heads of the American Indians, 249; quadrupeds different from other, but adapted to their several ways of living, and how, 277; in all birds, except noctural, the head smaller and less proportioned to the body than in quadrupeds, iii. 30; of the great Greenland whale makes a third of its bulk, 244.

Hearing, extreme delicacy of this sense in birds; iii. 31; that sense in whales, 245

Hearse, name of the female of the stag, the second year, ii. 67.

Heart, a broken heart, in common language, a disorder caused by hunger, i. 208.

Heat, Boerhaave considered it so prejudicial to health, that he never went near a fire, i. 131; of the blood in man and other animals about thirty degrees above congelation; in the marmot, and other animals, which sleep the winter, it is not above ten, ii. 195.

Hecla, the bellowings of that volcano, believed by the inhabitants of Iceland to be the cries of the damned, i. 41.

Hedge-hog, the most harmless of animals; its description; usual appearance upon the approach of danger; to disgust its enemy from pursuit, sheds its urine, the smell of which is sufficient to send him off; sleeps by day, and ventures out by night; places where found; its food; does not suck cattle; are not hurtful in gardens or orchards; the spines so disposed, that no fruit will stick upon them; appears serviceable in ridding the fields of insects and worms; Mr. Buffon accuses it of tricks, of which, from its form and habits, one would not be led to suspect it; he kept males and females together, but they never coupled; time of their coupling; sleep during winter, but do not lay up provisions for that season; at no time eat much, and remain long without food; blood cold, and their flesh not good for food; their skins converted to no use, except to muzzle calves from sucking, ii. 216 to 218; destroyed and devoured by the fox; in what manner, 148 to 150.

Hedge-hog of the sea, a cartilaginous fish of the sea-orb kind, iii. 280.

Hedge-sparrow, a slender billed bird, iii. 141.

Height, Maximin, the Emperor, above nine feet in stature, i. 204.

Heliogabalus, noted for having the brains of six hundred ostriches dressed in one dish, iii. 49.

Hellebore, a quantity of the black sort, pounded carelessly, purged several persons who were present, and the operator strongly, i. 132.

Helmo's (*St.*) fire, or the mariner's light, i. 152.

Helmont, his experiment to show all things made of water, i. 71.

Hemisphere, half illuminated by northern lights, i. 151.

Hemlock, eat by the horse without injury, ii. 5.

Hemuse, name hunters give the roebuck the third year, ii. 76.

Hen, in the Museum at Brussels, a creature covered with feathers and hair, said to be bred between a rabbit and a hen, ii. 183.

Hen of the common sort, moderately fed, lays above an hundred eggs from spring to autumn, iii. 38; after three years become effete and barren; clutches one brood of chickens in a season; instances of two very rare; number of eggs of a domestic hen in the year above two hundred, being well fed, supplied with water, and at liberty; trodden by the cock or not, she continues to lay; eggs of this kind never by hatching produce living animals; her nest made without care; clucking season artificially protracted, and entirely removed, in what manner; left to herself, would seldom lay above twenty eggs without attempting to hatch them; as she lays, her eggs being removed, she continues to increase the number; in the wild state, seldom lays above fifteen eggs; particularities of incubation; affection and pride after producing chickens; every invading animal she boldly attacks, the horse, the hog, or the mastiff; marching before her little troop, by a variety of notes calls her train to their food, or warns them of danger; instance of the brood running for security into a hedge, while the hen stood boldly forth, and faced a fox that came for plunder artificial method of hatching chickens in stoves, practised at Grand Cairo, or in a laboratory with graduated heat, effected with woollen hens, by Mr. Reaumur; by these contrivances, from a hen naturally producing twelve chickens in the year, are obtained artificially above two hundred, 88, 89; common hen supplies the place of the hen-pheasant, when refusing to hatch her eggs, and performs the task with perseverance and success, 97.

Hen (*Guinea.*) or *Barbary hen*, described, iii. 98.

Hen (*water.*) described; residence and food; nest and habits, iii. 187, 188.

Henry IV. king of Denmark, desirous of trying the skill of a musician, who boasted he could excite men to madness, submitted to the operation, became mad and killed four of his attendants, i. 224.

Herculaneum overwhelmed in that eruption of Vesuvius in which Pliny the naturalist was suffocated; its ruins lately discovered at sixty feet below the surface, and forty below the bottom of the sea, i. 43.

Hermaphrodites, such are all animals of the snail kind, iv. 33; the bivalve tribe are so too; they require no assistance from each other towards impregnation, 37.

Hermetical-sealing, a glass vessel, the meaning of it, i. 72.

Heron, a ruminating bird, ii. 28; the great heron, in former times, bred familiarly in our marshes; not now, and why, iii. 39; anatomical distinction in which herons differ from other birds; of this tribe Brisson has enumerated forty-seven sorts; excessively destructive and voracious; ever have lean and carrion bodies; description of the common heron; flies at the approach of the sparrow-hawk; commits the greatest devastations in fresh waters; a fish ever so large he will strike at, though unable to carry it away; one heron, says Willoughby, will destroy fifteen thousand carp in half a year; usual attitude, waiting for prey; food in cold and stormy seasons; manner of fishing; Willoughby's receipt for taking them; their nests; never in flocks when they fish, but making nests, they love each other's society; flesh of the young esteemed in France; method used to obtain them; the young once excluded, the old incessantly provide them with an amazing quantity of fish; instance of it; by Mr. Keysler's account, this bird may exceed sixty years; recent instance of one taken in Holland, with a silver plate to one leg, and an inscription, that it had been struck by the Elector of Cologne's hawks thirty-five years before; they contract a consumptive disposition, 170 to 172.

Heron-hawking, a favourite diversion among our ancestors, had laws enacted for the preservation of the species; he who destroyed their eggs was liable to a penalty of twenty shillings for each offence, iii. 171.

Herrera confirms the existence of giants, i. 258.

Herring, its description, iii. 288; of migrating fish, this and the pilchard take the most adventurous voyages; places where the herrings are in the greatest abundance; numerous enemies met in their migrations; in Chesapeake bay, the shoals so great as to cover the shores, and become a nuisance; that body upon our coast begins to appear off the Shetland isles in April; forerunners, the grand shoal descending in June, and announced by the gannet, gull, &c.; fishermen take two thousand barrels at a single draught; places of Europe where herrings are punctual in their visitations: doubts in every part of their migration; first great bank for herrings was along the Norway shores; before 1584, the number of ships from various parts of Europe resorting thither, exceeded some thousands; quantity of herrings then assembled there, was such, that a spear stuck in the water, as Olaus Magnus asserts, would stand on end; soon after that period, they deserted the Norway shores, and took up along the German coasts; no cause assigned for this seemingly capricious desertion; their greatest colonies now in the British channel, and upon the Irish shores; a herring suffered to multiply unmolested, and undiminished for twenty years, would show a progeny greater in bulk than ten such globes as that we live upon, 293 to 296.

Hertfordshire, a dreadful storm which happened in it, in 1697, described, i. 150.

Hexagons, with Pappus, the most convenient figures in building; cells of bees are perfect hexagons, iv. 176.

Hide of the elk, often known to turn a musket ball, ii. 80.

Hiera island, in the Mediterranean, risen and formed by subterraneous explosions, i. 55.

Hiero. See *Archimedes*, i. 80.

Hind, or female of the stag, has no horns; time of gestation, and usual season of bringing forth; hides her young in obscure thickets; obliged to use all arts to conceal them from the stag, the most dangerous of her pursuers; how she defends her young, ii. 65; the female stag still so called, the third year, 67; manner of knowing the track of a hind, 68; inhabitants of Canada have no other milk but that of the hind; and no other cheese but that made of it, 71; the hunters name for the roebuck, the first year, 76.

Hippocampus, the *sea-horse*, its description, iii. 279.

Hippocrates, his opinion about the formation of the incipient animal, i. 166.

Hippopotamos, not afraid singly to oppose the lion, ii. 110; its dimensions; places where it resides; its food; swims with much force, and remains at the bottom for thirty or forty minutes; it commits dreadful havock among the plantations; method the Africans use to frighten it back to its element; inoffensive in arts and disposition; never attacks mariners in their boats, unless inadvertently struck against, or otherwise disturbed, then it would send them at once to the bottom; instances of its great strength; never goes beyond the mouth of fresh water rivers; attacked on shore, and incapable of vengeance upon a flying enemy, returns to the river, and plunges in head foremost; the negroes, apprised of its force, do not engage it; continues uncontrolled master of the river, all others fly its approach, or become an easy prey; moves slowly upon land; seldom goes from the river side, unless pressed by necessities of hunger, or of bringing forth its young; lives upon fish and vegetables; natives of Africa say it often devours children, and other creatures surprised upon land; the young are excellent eating; the female seldom produce above one at a time; hearing the slightest noise, she dashes into the stream, and the young one follows her with equal alacrity; Dr. Pococke has seen their flesh sold in shambles like beef; their breast thought as delicate eating as veal; this creature, once plenty at the mouth of the Nile, now wholly unknown in Lower Egypt, and no where found but above the cataracts, 289 to 291.

Historian, (*natural*,) what his proper business, i. 11; going too much into speculation certainly wrong, and why, 16; method his principal help, 268; faults of systematic writers, 269.

History, (*natural*,) of all other sciences has the least danger of obscurity, and why, i. 272; best set forth, as Mr. Locke has observed, by drawings of animals, taken from life, 275; rule in natural history, that neither horns, colour, fineness, or length of hair, or position of ears make actual distinctions in the kinds, ii. 48; accounts of fishes little entertaining; philosophers not studying their nature, but employed in increasing their catalogues, iii. 229; Dampier has added more to it than half the philosophers before him, iv. 20; one of the strangest discoveries in all natural history, 207.

Hobby, bird of the generous breed of hawks, for smaller game, daring larks, and stooping at quails, iii. 72.

Hogs, animals of this kind resemble those of the horse as well as the cow kind, and in what; this kind partakes of the rapacious and the peaceful kinds; offends no animal of the forest; remarkable that none of this kind ever shed their teeth; any animal dying in the forest, or so wounded as to make no resistance, is the prey of the hog, who refuses no animal food, however putrid; in a state of wildness, most delicate in the choice of its vegetables, rejects a greater number than any other; they eat but seventy-two plants, and reject a hundred and seventy; indelicacy of this animal more in our apprehensions than in its nature, and why; in orchards of peach-trees in North America, rejects the fruit that has lain a few hours on the ground, and watch hours for a fresh wind-fall; have had mice burrowing in their backs while fattening in the sty, without seeming to perceive it; scent the hounds at a distance; by nature stupid, inactive, and drowsy; has passions more active only when incited by venery, or when the wind blows with vehemence; foresees the approach of bad weather; much agitated on hearing any of its kind in distress; have often gathered round a dog that teazed them, and killed him upon the spot; their various diseases; generally live, when permitted, to eighteen or twenty years; the females produce to the age of fifteen; in the wild state less prolific, ii. 89 to 92.

Hog, (*Guinea*,) and that about Upsal described, ii. 93.

Hog, (*water*.) See *Capibara*, ii. 96.

Hog of Borneo. See *Babyroussa*, ii. 97.

Hog of the isthmus of Darien, described by Wafer, ii. 99.

Hoanho, a river in Asia; its course, i. 88; receives thirty-five lesser rivers, 91.

Holland, a conquest from the sea, and rescued from its bosom; the surface of it earth below the level of the bottom of the sea; upon approaching the coast, it is looked down upon from the sea, as into a valley; is every day rising higher, and by what means; those parts which formerly admitted large men of war, are now too shallow to receive ships of moderate burden, i. 112, 113.

Honey, the polecat and the martin feed upon honey, ii. 159; from what part of the flower it is extracted, iv. 178; two kinds of it; which to be preferred, 183; that gathered by the humble-bee, 184; gathered by the black bees in the tropical climates neither so unpalatable, nor so surfeiting as ours; produced by the bees at Guadaloupe, 183 to 185.

Honeycomb, name of the second stomach of ruminating animals, ii. 27.

Hoof of the Persian mares, so hard, that shoeing is unnecessary, ii. 10.

Hooper, the name of the wild swan, on account of the harshness of its voice, iii. 215.

Horizon, seems wrapt in a muddy cloud, upon the approach of winter, under the line, i. 151.

Horn, to wind it, and to carry the hawk fair, formerly sufficient accomplishments for noblemen's sons, iii. 71.

Horns, in what manner those of animals are produced, i. 198; grow differently in deer from those of sheep or cows; deers' horns furrowed along the sides, and why; in every respect resembling a vegetable substance, grafted upon the head of the stag, beauty and size of those of a stag, mark their strength and their vigour; the time of shedding them; severe winters retard the shedding the horns in stags; generally increase in thickness and height from the second year to the eighth; partake of the nature of the soil; their horns shed, they seek the plainer part of the country, remote from those animals they are then unable to oppose, and walk with their heads stooping down, to prevent striking against the branches of a tree, ii. 62, 63; of a stag, called his head; their names according to different ages of the stag, 67; the author saw one of ten feet nine inches, from one tip to the other, 78; of the elk applied to the same purposes as hartshorn, 80; rein-deer converted into glue; of the rhinoceros, sometimes from three to three feet and a half long, composed of the most solid substance, and pointed to inflict most fatal wounds, 287; of owls nothing more than two or three feathers that stand up on each side of the head, over the ear, iii. 79.

Horses, characteristic marks given by Linnæus; eats hemlock without injury, ii. 5; near as the ape approaches man in external conformation, so the horse is the most remote; wild horses herd together, and feed in droves of five or six hundred; one among their number always stands a sentinel, 6; there are but three animals of the horse kind, 22; a horse will not carry upon its back a weight of more than two or three hundred pounds, i. 202; to estimate the strength of a horse, is not to try what he can carry, but what he can draw; he draws a load ten men cannot move; and in some cases a draft-horse draws better being somewhat loaded, 203; allured by music, 223; not readily attacked by the lion; the combats between them in Italy, 279; one fond of oysters, 282; from what country the horse came originally uncertain; according to the ancients, wild horses once in Europe; the colder climates do not agree with them; how wild horses are caught; set at liberty they never become wild again; the Buccaneers agreeably surprised to see their faithful horses present themselves again with their usual assiduity, and receive the rein; this animal in the state of nature in the old, not the new world, ii. 6; wild horses finding a tame horse to associate with them, gather round him, and oblige him to seek safety by flight; countries where wild horses are found; the natives of Angola, or Cafraria, catch a horse only to eat him; *Arabian wild horses*, the most beautiful breed, the most generous, swift, and persevering; the negroes show terror and surprise, when first they see a horse, 7; no Arabian, however poor, but has his horse; tame Arabian horses, some valued at a thousand ducats, 8; different classes among the Arabians; they know the race of a horse by his appearance; Arabians preserve the pedigree of their horses with care, for several ages, 8; countries into which the race of their horses has spread itself, 12; they take the wild horses with traps; the young horse considered by them as a great delicacy; they feast upon him while any part is remaining; the usual manner of trying the swiftness of Arabian horses, by hunting the ostrich; and a horse of the first speed is able to out-run it, 8; treat their horses gently; hold a discourse with them; written attestations given to persons who buy Arabian horses; they stand stock still in the midst of their career, the rider happening to fall; keep them saddled at their tents from morning to night, to prevent surprise; when the Arabians begin to break their horses; how the Arabians dress and feed their horses, 9; first began the management of horses in the time of sheque Ismael; the rapidity of the flight of Arabian horses is such that the dogs give up the pursuit, 8; upon computation, the speed of the English horses is one fourth greater carrying a rider, than that of the swiftest barb without one; Numidian race much degenerated; the Tingitanians and Egyptians have the fame of rearing the finest horses, for size and beauty, 10; horses of Barbary; an Italian peculiar sport, in which horses of this breed run against each other, 10; Spanish genette described, 10; those of Andalusia pass for the best, and preferred as war horses to every other country; Italian horses have a particular aptitude to prance, 11; the horses of *India*, weak and washy; fed with peas, sugar and butter; one brought to England not much larger than a common mastiff; climates excessively hot seem unfavourable to horses; remarkable sports on horseback; the horses of the Gold Goast and Guinea extremely little, but very manageable; of *China*, weak, little, ill-shaped, and cowardly; those of *Corea*, timorous, as not to be serviceable in war, 13, 14; *Tartar* horses very serviceable in war; they were, properly, the conquerors of China; march two or three days without stop ping; continue five or six, without eating more than a handful of grass at every eight hours; and remain without drinking four and twenty hours; lose all their strength when brought into China or the Indies; thrive pretty well in Persia and Turkey; ancient opinions on the nature and qualities of the horses of Thessaly, Achaia, Ethiopia, Arabia, Africa, Italy, and particularly of Apulia, of Sicily, Capadocia, Syria, Armenia, Media, Persia; of Sardinia, and Corsica; of Spain, Walachia, Transylvania; of Denmark, Scandinavia, Flanders; of the Gaulish horses; of the German. Swiss, Hungarian, and lastly of the English horses, 14, 15; *Danish* horses of such excellent size and strong make, that they are preferred to all others for draught; some streaked like the tiger, or mottled like the leopard; *German* and *Hungarian* horses; *Dutch* horses are good for draught, the best come from the province of Friezland; the *Flanders* horses, 14; few *French* horses good; in general are heavy shouldered; the best of the country come from Limosin, and Normandy furnishes the next; *American* tame horses admirable; method of hunting with them, 12; islands of the Archipelago have very good horses; those of Crete were in great reputation among the ancients, at present used in the country itself, because of the unevenness of the ground; the original horses of *Morocco*, smaller than the Arabian breed; in Turkey there are horses of all races; *Persian* horses, in general, the most beautiful and most valuable of all the east, 12; some greatly esteemed in the Ukraine, in Walachia, Poland, Sweden, 14; *English* horses excel the Arabian in size and swiftness; are more durable than the barb, and more hardy than the Persian; one instance of their great rapidity, in the admirable Childers, frequently known to move eighty-two feet and a half in a second, 14; fault of our manner of breaking horses; the French managed horse never falls before, but more usually on one side; the English are for speed and despatch, the French, and other nations, are more for parade and spirit; English hunters considered the noblest and the most useful horses in the world, 15; Roger de Belegme, the first recorded to have attempted mending our native breed; number of horses in London in the reign of King Stephen, said to have amounted to twenty thousand; in the times of Queen Elizabeth, the kingdom could not supply two thousand horses to form the cavalry; Powisland, in Wales, for many ages famous for a swift and a generous race of horses, and why, 16; perfections which a horse ought to have, according to Camerarius, 16; a ruminating animal, ii. 28; in a course of years impoverish the ground, 30; the horse and the ass differ not so much in form as the cow and the bison, yet the former are distinct animals and the latter animals of the same kind, 32; eats two hundred and sixty-two plants, and rejects two hundred and twelve, 84; famished horses more hairy than those fed plentifully, 158; for hunting lions, must be of that sort called charossi; all others fly at the sight of the lion, 110; are killed by wild asses, 19; destroyed by the American bat, called vampyre, in South America, 233.

Horse (*Sea*,) described, iii. 209.

Hortensius, the orator, the first who had peacocks served up at an entertainment in Rome, iii. 91.

Hospitals erected in India for the maintenance of all kinds of vermin, i. 245; for monkeys, erected by the Bramins, ii. 266.

Hottentots outstrip lions in the chase, as travellers report, i. 204; make much and very extraordinary use of the bison, ii. 35.

Hound, *harrier* and *beagle*, all of the same kind; *grey matin hound*, transported to the North, becomes a great Danish dog, and this sent into the South, becomes a greyhound of different sizes; the same transported into Ireland, the Ukraine, Tartary, Epirus, and Albania, becomes the great wolf-dog known by the name of the *Irish wolf dog;* the *blood-hound*, a dog of the generous kind; and likewise the *gaze-hound*, and the *greyhound;* the blood-hound a dog of great use, and in high esteem among our ancestors; its employ; the gaze-hound hunted, like our greyhound, by the eye, not by the scent, ii. 132, 133; *Greyhound fox*, the largest, tallest, and boldest of the kind, ii. 150.

Howlet, a kind of owl without horns, iii. 80.

Hudson's Bay, above twelve thousand martins' skins annually imported from thence into England, ii. 165.

Huers, name give to the men employed to give signals where to extend the nets in the pilchard-fishery, iii. 295.

Hugh. See *Polypus*, iv. 220.

Hull had the honour of first attempting that profitable branch of trade, the whale-fishery, iii. 249.

Humber, a new island formed at the mouth of this river; it is about nine miles in circumference, and worth to the proprietor about eight hundred pounds a-year, i. 58

Humming-bird is the smallest of birds, and seems nearly allied to the insect, iii. 40.

belongs to the sparrow kind, 142; the smallest of them about the size of a hazel-nut; its description; the larger humming-bird is near half as big as the common wren; its description; are seen fluttering about the flowers, without ever lighting upon them, their wings in such rapid motion, it is impossible to discern their colours, except by their glittering; but only extracting the honey as with a kiss; their nests and the number of eggs; their time of incubation; instance of their docility; countries where found, in the Leeward Islands, they continue in a torpid state during the severity of winter; Labat asserts, that, besides the humming noise produced by the wings, they have a pleasing melancholy melody in their voices, small and proportioned to their organs; the Indians made use of this pretty bird's plumage; in what manner the children take them; when taken, they are instantly killed, and hung up in the chimney to dry; some dry them in stoves; at present the bird is taken rather for selling as a curiosity to Europeans than an ornament for themselves, iii. 157 to 159.

Hump of the bison of different sizes, weighing from forty to fifty pounds, sometimes less; cuts and tastes like a dressed udder; in a few generations it wears away, ii. 35.

Hunger, every animal endures the want of sleep and hunger with less injury to health than man; hunger kills man sooner than watchfulness; more dreadful in its approaches than continuance; dreadful effects of hunger, related to the author, by the captain of a ship, who was one of six that endured it in its extremities; different opinions concerning the cause of hunger; few instances of men dying, except at sea, of absolute hunger; those men whose every day may be considered as a happy escape from famine, at last die of a disorder caused by hunger; the number of such as die in London of hunger supposed not less than two thousand a-year; method of palliating hunger among the American Indians, i. 206 to 209; instances of amazing patience in hunger, 241.

Hunters, the English considered as the noblest and most useful horses in the world, ii. 15; terms used by hunters in pursuing the stag; names invented by them for the stag, 68; for the fallow-deer, 73.

Hunting, the natural rights of hunting made royal, and when, ii. 66; the stag and the buck performed in the same manner in England, and how, 67, 68; ancient manner of hunting the stag, 70; the manner in Sicily, and in China, 70; the wolf, 144; wolves used in hunting, 146; hunting of the fox, 148; hunting the sable, chiefly the lot of the exiles in Siberia, 166; the ouran-outang, or wild man in Borneo, a favourite amusement of the king, 215; of the elephant at the Cape of Good Hope, 284; the method used to take it alive, 280, 281; manner of hunting the ostrich by the Arabians, and by the Struthophagi, iii. 49; manner of hunting the turkey, 93.

Hurco (*Aufidius*,) charged by Pliny, with being the first who fatted peacocks for the feasts of the luxurious, iii. 91.

Hurricane, the cloud preceding a hurricane, called by sailors *bull's eye*, described; houses, made of timber, bend to the blast of the hurricane like osiers, and recover their rectitude; hurricanes offensive to the sense of smelling; maggots brought with them, i. 144; common in all tropical climates; on the coasts of Guinea, frequently three or four in a day; their seasons upon those coasts, at Loango, and the opposite coast of Africa; the hurricane called tornado; its dreadful effects, 145.

Hus, in Greek, signifies a sow, and *huaina* derived from it, ii. 154.

Huso, the isinglass fish, caught in great quantities in the Danube, from October to January; furnishes the commodity called isinglass; often above four hundred pounds weight; its flesh salted is better tasted, and turned red like salmon, iii. 277.

Hyæna, no words give an idea adequate to this animal's figure, deformity, and fierceness; more savage and untameable than any quadruped; its description; defends itself against the lion, is a match for the panther, and attacks the ounce, which it seldom fails to conquer; an obscene and solitary animal; its first howl sometimes mistaken for the voice of a man moaning; its latter like the violent efforts of reaching; whence it first took its name; native of the torrid zone, resides in the caverns of mountains, the clefts of rocks, or dens it has formed under earth; taken ever so young, it never can be tamed; sometimes attacks man, and carries off cattle; its eyes shine by night, and it is asserted that it sees better by night than by day; scrapes up graves and devours dead bodies, how putrid soever; absurdities of the ancients about this animal, iii. 153 to 155.

I.

Jabiru and *jabiru-guacu*, birds of the crane kind, natives of Brazil; their descriptions, iii. 169.

Jackals, hunt in a pack, and encourage each other by mutual cries; what has given rise to the report of its being the lion's provider, i. 280; travellers have mistaken the jackal for the fox; one of the commonest wild animals in the East, yet scarce any less known in Europe, or less distinctly described by natural historians; its description; its cry a lamentation resembling that of human distress; is more noisy in its pursuits than a dog, more voracious than the wolf; never goes alone, but always in a pack of forty or fifty together; seems little afraid of man; pursues its game to the doors, without apprehension; enters insolently into sheep-folds, yards, and stables, and finding nothing else, devours leather harness, boots, and shoes; scratches up new made graves, and devours the corpse, how putrid soever; the corpse how dug up; follows armies, and keeps in the rear of caravans; the most putrid substances it greedily devours; hides in holes by day, and appears abroad at night-fall; hunts by the scent; irreconcilable antipathy between it and the dog; no wonder it be voracious, and why; is as stupid as impudent; instances of it; Indian peasants often chase it as we do foxes, ii. 250 to 252.

Jackdaw, its description, iii. 111; rings found in the nest of a tame jackdaw, 108.

Jacobines, a kind of pigeons, iii. 134.

Jaculus, the swiftest serpent, its manner of progression by coiling, iv. 87.

Jaguar, or the panther of America, ii. 120.

James, the hermit, said to have lived a hundred and four years, i. 209.

Japanese, description of that people, i. 243.

Jaw, the upper, thought by many quite immoveable; that it moves in man, an easy experiment will evince; has its proper muscles behind the head for thus raising and depressing it; the under jaw in the embryo much advanced before the upper, and in the adult it hangs more backward; in a Chinese face it falls still more backward than with us, the difference is thought half an inch, the mouth being shut naturally; M'Laurin, a professor at Edinburgh, was subject to have his jaw dislocated; the under-jaw has often an involuntary quivering motion; and often a state of languor produces another; that of yawning, a very sympathetic kind of languid motion; ridiculous instance of this sympathetic affection commonly practised upon the same famous M'Laurin, i. 194.

Jay, one of the most beautiful of the British birds; its description; feeds upon fruits, kills small birds, and is extremely docile, iii. 115; lays its eggs in the holes deserted by the woodpecker, 120.

Ibex, a native of the Alps, the Pyrenees, and the mountains of Greece; its description, ii. 49.

Ibis, the Egyptians paid divine honours to this bird; different opinions concerning the ancient and modern ibis; Mailler's observation to this purpose; the true ibis thought a bird of the vulture kind, called by some the capon of Pharaoh. iii. 167.

Ice, very elastic, i. 76; floats of it diffused into plains of above two hundred leagues in length; and mountains of it rising amidst them; flat ice and mountain ice, 100; their formation; mountains of it presenting the resemblance of a glory, 101.

Ichneumon, by some injudiciously denominated the cat of Pharaoh, one of the boldest and most useful animals of the weasel kind; used in Egypt for the same purposes as cats in Europe; description; discovers and destroys the eggs of the crocodile; serpents its most natural food; grows fast and dies soon; easily strangles a cat stronger and larger than itself; countries where found; attacks every living thing it is able to overcome, and fears not the force of the dog, nor the claws of the vulture; takes the water like an otter, and will continue under much longer; not able to support the rigour of our winters; one come from the island of Ceylon, climbed up the walls and the trees with very great ease; this animal one of those formerly worshipped by the Egyptians, ii. 96, 97.

Ichneumon fly, its weapon of defence; flies of this tribe owe their birth to the destruction of some other insect, within whose body they have been deposited, and upon whose vitals they have preyed, till they came to maturity; of all others the most formidable to insects of various kinds; it makes the body of the caterpillar the place for depositing its eggs; the tribe is not the caterpillar's offspring, as was supposed, but its murderers; description; whence its name; fears not the wasp, and plunders its habitations; various appetites of the various kinds of this fly; the millions of insects this fly kills in a summer inconceivable, iv. 191, 192.

Ichneumon, a root the Indians believe an antidote for the bite of the asp or the viper, ii. 167.

Idra, the deplorable infirmities of the workmen in the quicksilver mines near it, i. 38.

Jean-le-Blanc, a kind of eagle; its distinctive marks, iii. 64.

Jenisea, in Tartary, a river, i. 88; receives above sixty lesser rivers, 90.

Jenkins, a peasant, lived to a hundred and sixty-five years, without much regularity, i. 135.

Jester, in England, as late as the times of King James I. the court was furnished with a jester, i. 254.

Jevraska. name given to the mammout in Siberia, iv. 189.

Jewels, the richest jewels found in an Ethiop's ear, a proverb, i. 197.

Ignis fatuus, or wandering fire, i. 152.

Iguana, description of this animal; its flesh the greatest delicacy of Africa and America, its food; in what manner it is taken, iv. 75.

Jiboya, the great, of Java and Brazil, the dimensions of this serpent, iv. 105.

Ilex, the berry-bearing ilex, iv. 203.

Imagination, by day as well as by night, always employed, i. 213; very remarkable instances of its power in women, 252.

Impaling, in some courts of the more barbarous princes of India, they employ the elephant to impale the criminals on its enormous tusks, ii. 283.

Impregnation, the hare, though already impregnated, admits the male, and receives a second impregnation, ii. 178; in what manner the sea and garden-snails impregnate each other respectively, iv. 30 to 33; the bivalve shell-fish require no assistance from each other towards impregnation, 37; frogs impregnated without any apparent instrument of generation, an object of inquiry; continues in great obscurity; experiments made to this purpose, 50.

Incas, Father Acosta, and Garcilasso de la Vega have seen the bodies of several incas perfectly preserved from corruption, i. 262.

India (*East*,) in the warm countries of India, the women are marriageable at nine or ten, and the men at twelve or thirteen, i. 186; description of the inhabitants of the islands that lie scattered in the Indian ocean; over all India, children arrive sooner at maturity than in Europe; they often marry and consummate, the husband at ten years old, and the wife at eight, and frequently have children at that age; Indians have long been remarkable for cowardice and effeminacy, they may be considered as a feeble race of sensualists; their dress, 244, 245; the horses of India are weak and washy, ii. 13; lions are found to diminish in their numbers in this country, 106; the Indians eagerly pursue the porcupine, in order to make embroidery of its quills, and to eat its flesh, 220; they eat bats in the East Indies, 231. See *Elephant*, ii. 283.

India (*West*,) whence originally come the flat heads of the American Indians, i. 249.

Indus, river, its course, i. 88; its water and that of the Thames, the most light and wholesome in the world, 72; the tide at the mouth of this river the greatest known, 105.

Infants, just born, may be said to come from one element into another, and why: open their eyes the instant of their birth; more capable of sustaining hunger, and more patient of cold than grown persons, and why; infants have milk in their own breasts; their life very precarious till the age of three or four; instances of it; the comparative progress of the understanding greater in infants, than in children of three or four years old, i. 279 to 281.

Inundations generally greater towards the source of rivers, than farther down and why, i. 86; some distribute health and plenty; others cause diseases, famine, and death, 91; every inundation of the sea attended with some correspondent dereliction of another shore; one of the most considerable inundations in history, is that which happened in the reign of Henry the First; an inundation in the territory of Dort, destroyed a hundred thousand persons, and yet a greater number round the Duliart; remarkable inundations in Friezland and Zealand, in which more than three hundred villages were overwhelmed; their remains continue visible at the bottom of the water in a clear day; some in which the sea has overflowed the country, and afterwards retired, 113, 114; inundation of the Thames at Dagenham, in Essex, 115; instantly produced by land spouts, 158.

Insects, in the internal parts of South America and Africa, they grow to a prodigious size, and why; those of the minute kind in the northern climates not half so large as in the temperate zone; the ocean has its insects; their feet are placed upon their backs, and almost without eyes, i. 162, 163; in some countries almost darken the air, and a candle cannot be lighted, without their instantly flying upon it, and putting out the flame, 165, and iv. 207; many may be multiplied by being cut in pieces, i. 169; many of the tribes brought forth from the egg, 170; have no eye-lids whatsoever, 192; the Indians are fearful of killing the meanest, 144; quickly brought to change, and adapt themselves to the climate, 277; have their stomachs composed of muscular fibres; of a ruminating kind, ii. 28, 29; afford so great a variety as to elude the search of the most inquisitive pursuer, iii. 28; those with the greatest number of legs move the slowest, iv. 45; the general definition of insects, 107; the different classes, 108; general characteristics of insects without wings, 109; of those that have wings, 133; some continue under the form of an aurelia not ten days; some twenty some several months, and even for a year, 161; general rule, that the female is larger than the male, 166; every insect that lives a year after its full growth, is obliged to pass four or five months without nourishment, and will seem to be dead all that time, 196; description of that which forms and resides in the gall-nut, 204.

Instinct of animals in choosing the proper times of copulation, i. 286; the Guinea pig has not that natural instinct so common to almost every other creature, ii. 199.

Intestines, in all animals the size of the intestines proportioned to the nature of the food, i. 279; intestines of ruminating animals enlarged by nature, to take in a greater supply: those of the carnivorous kind are short, ii. 27, 28; also thin and lean; but of the ruminating are strong, fleshy, and covered with fat, 28; of sheep found to be above thirty times the length of the body; those of the wild cat not above three times the length of its body, 104; this shortness still unaccounted for, 105; of the rein-deer, washed like our tripe, in high esteem among the Laplanders, 87; of the bat, in some measure resemble those of man, 220; those of the manati longer, in proportion, than those of any other creature, the horse excepted, 248; the tribe of woodpeckers want that intestine called the cæcum, iii. 118; the lamprey seems to have but one, 273; those of the crab have many convolutions, iv. 10.

Johndore, Quin noted for a sauce to this fish, iii. 240.

Joints, hair in its growth sends fort branches at the joints, i. 192.

Jonelin has obliged the curious with the first accurate description of the form and nature of the sable, ii. 165.

Ireland not infested with wolves, ii. 145; frogs designedly introduced into that kingdom some years before the Norway rat, 203; that rat put a stop to their increase, and the frog is once more almost extinct in that kingdom, 204; the mole utterly a stranger there, 213.

Iron extracted from all the substances upon earth, i. 36.

Isatis, an animal very common in all northern countries bordering upon the icy sea, and seldom found in warm climates; description; burrows like the fox, and when with young, the female retires to her kennel, in the same manner as the fox; its kennel very narrow, and extremely deep, has many outlets; manner of coupling, time of gestation, and number of young, all similar to what is found in the fox; brings forth at the end of May, or the beginning of June; considered as between the dog and the fox; changes its colour, and is at one time brown, at another white; time in which it is called the *crost fox*, ii. 152.

Isinglass, serviceable in medicine, and many arts; manner of making it; principally furnished from Russia, where great quantities are prepared surprisingly cheap; Mr. Jackson found out a method of making a glue that answered the purposes of isinglass, iii. 277.

Islands, new formed, in two ways; thirteen islands in the Mediterranean appearing at once emerging from the water; one new formed in the year 1720 near that of Tercera; formed at the mouths of many rivers, and how; a beautiful and large one formed at the mouth of the river Nanquin, in China, not less than sixty miles long, and about twenty broad, i. 55 to 59; appear, at first, infinitely greater than they naturally are; seem to travel to the shore, and represent a wood; the scene then shifted, represents curious figures, ships with sails, streamers, and flags, antique elevated castles, and at length vanish into nothing, 155.

Ismael, (*Sheque*,) in his time the Arabians first began the management of horses, ii. 8.

Ispahan, the prince's messengers go on foot thirty-six leagues in fourteen hours, i. 203.

Italy, the horses there have a particular aptitude to prance, ii. 11.

Jucatan, a peninsula in the Gulf of Mexico, formerly a part of the sea, i. 113.

Juda-goat common in Guinea, Angola, and all along the coasts of Africa, not much larger than a hare, ii. 48.

Jugular fish, name given to that fish which has the ventral fins placed more forward than the pectoral, iii. 281.

Julian's Bay, (*St.*) an American harbour, forty-nine degrees south of the line; Ferdinand Magellan happened to winter in it, i. 257.

Juniper, its shade was fatal if we credit the ancients, i. 131; the Laplanders drink water in which these berries have been infused, 241.

Ivory, the tusks of the babyrouessa are a very fine ivory, smoother and whiter than that of the elephant, but not so hard and serviceable, ii. 98; that of the morse more esteemed than that of the elephant, being whiter and harder, 246; almost all our ivory comes from Africa, where the greatest part is found in the forests; the tusks of the mammoth converted to purposes of ivory, 284; teeth of the narwhale far surpass ivory in all its qualities, iii. 251.

Justinian, the emperor, till his time the sea was open to all nations, i. 96.

Ivy-berries, showers of them raised by tempests in one country, and falling in another, i. 155.

K.

Kabassou, or cataphractus, one of the largest kinds of the armadillo, ii. 228.

Kamschatka, description of its natives, ii. 243.

Kanguroo. an animal first discovered and described by Mr. Banks, iii. 24.

Keratophites, among the coralline fungi, iv. 222.

Kermes, an insect of great use in medicine and dying; its description; the difference of the male from the female; the harvest of the kermes greater or less in proportion to the severity of the winter; women gather them before sun-rising, tearing them off with their nails, iv. 203.

Kestril, a bird of the generous breed of hawks, iii. 73.

Kevel, name of a second variety of gazelles, made by Mr. Buffon, ii. 53.

Kilda, (*St.*) a rocky island; its shores to the West six hundred fathom perpendicular above the surface of the sea, i. 111; the inhabitants consume annually near twenty-three thousand young gannets, and a great quantity of their eggs. iii. 200; its rocks more than three quarters of a mile high, 201.

Killer, a cetaceous animal of surprising strength, which attacks the whale, iii. 248.

Kinds of animals not actually distinguished by horns, colour, position of the ears, of fineness of hair, ii. 48; difficult to fix precise boundaries between the goat kind and the deer; the gazelles form a distinct kind, 52; all of the deer-kind have no gall-bladder, 60.

Kine, in Iceland, are without horns, ii. 34.

King, a question in schools, which man most happy, the beggar by night, and king by day; or the beggar by day, and king by night, i. 212.

King-fisher, a remarkable bird; its description; places it frequents, and how it takes its prey; the plumage a beautiful variety of brilliant colours; instances of credulity with respect to this bird; its nest, or rather hole, very different from that described by the ancients; feeds upon fish in that hole; fœtid from the remains of fish; the king-fisher is found with from five to nine eggs, which the female continues to hatch; though disturbed and robbed, she returns and lays again; Reaumur's account of this; season for excluding the brood; the male, faithful beyond the turtle, brings the female large provisions of fish, and keeps her plump and fat; he used to twitter before, now enters the nest quietly and privately; the young hatched in twenty days; differ in their size and beauty, iii. 226 to 228.

King-fisher, the *Halcyon*—Cicero has written a long poem in praise of this bird, of which but two lines remain; the emperor Gordian has also written a long poem on it, nothing of which is left; St. Ambrose's credulity concerning this bird; fables the modern vulgar have of it; its flesh unfit to be eaten, and its beautiful plumage preserves its lustre longer than any other, iii. 226, 227.

Kircher, his calculations of the heighths of the mountains are incredible, and why, i. 67; has set the voices of birds to music, iii. 81.

Kite, from the greatest height darts down on its prey with unerring aim, iii. 31; one of the baser race of hawks, 72; distinguished by its forky tail, and slow floating motion; seems ever upon the wing, and to make no effort in flying; lives upon accidental carnage, every bird in the air being able to make its retreat from it; small birds wounded, or straying chickens it seizes with rapacity, 75; used for training falcons, and how lured with the great horned owl, when caught for that purpose, 81.

Kitten, of all young animals none more prettily playful, ii. 101.

Klein, his method of classing animals, i. 271.

Knobber, name of the stag the second year, ii. 67.

Knot, small bird of the crane kind, iii. 182; a bird of passage, 184.

Kob, the name of the sixth variety of gazelles, by Mr. Buffon, ii. 53.

Koba, name of the fifth variety of gazelles, by Mr. Buffon, ii. 53.

Kraken, all that has been said of this great fish seems fictitious, yet there is a possibility of its existence, iii. 244.

Krantz's account of the origin and formation of the ice-mountains of Greenland. i 101.

L.

Labrus, the wrasse, description of this fish, iii. 285.

Labyrinth of Candia, a subterranean wonder, supposed the work of art, i. 32.

Labyrinth, convolutions in the windpipe and lungs of some birds, iii. 32.

Lama, the camel of the new world; countries where found; their flesh an excellent food; their hair, or rather wool, spun into beautiful clothing; carry their burdens over precipices and craggy rocks, where men can scarce accompany them; description and age; manner of coupling; its food; exceeds the camel in temperance; requires little water, being supplied with quantities of saliva, the only offensive weapon it has to testify its resentment; the Indians say, where this saliva falls, it will, from its acrimonious nature, burn the skin, or cause dangerous eruptions; colour and wool; habits and marks of agility in the state of nature; seems the largest of the camel kind

America; the natives hunt the wild lama for its fleece; a smaller weaker sort of the camel kind, called also guanacoe and paco; the manufacture of stuffs, carpets, and quilts, made of the wool of the paco, form a considerable branch of commerce in South America, and might usefully be extended to Europe, iii. 9 to 11.

Lambs, how to be produced all the year round, i. 286; the third an ewe brings forth, supposed the best, ii. 45.

Lamprey, a fish, every way resembling the lamprey, was possessed of the numbing quality of the torpedo; people will not venture to touch those of Ireland; a species very different from ours served up as a delicacy among the modern Romans; doubtful whether it be the murena of the ancients, which our lamprey is not; ours differently estimated according to the season; those of the river Severn the most delicate of all fish; description of this fish's extraordinary power of adhering to stones; instance of it; Muralto giving the anatomy of this fish, makes no mention of the lungs, for which it has absolute necessity to breathe in the air; its time of leaving the sea annually, in order to spawn, is the beginning of spring; after a few months it returns to the sea; peculiar preparation for spawning; the young from eggs; the female remains at the place where produced; has her family playing about her, and conducts them in triumph to the ocean; its food; some continue in fresh water till they die; a single brood the extent of the female's fertility, two years being the limits of her existence; best season for them in the months of March, April, and May; are usually taken in nets with salmon, sometimes in baskets at the bottom of the river; old custom for the city of Gloucester annually to present the king with a lamprey pie; a senator of Rome used to throw into the ponds such of his slaves as displeased him, to feed the lampreys, iii. 272 to 274.

Lands, new, produced from the sea, and in what manner, i. 113.

Lanner, bird of the generous breed of hawks, now little known in Europe, iii. 72.

Lapland, its division, ii. 82; mountains there preferred to the woods; the country abounds more than others with marshy bottoms and weedy lakes; gnats and gadflies formidable there, 83; the manner of travelling in it; Laplanders castrate the rein-deer with their teeth, 85, 86; the wolf never attacks a rein-deer that is haltered, and why, 115; the isatis found in this country, 152; in the forests, squirrels observed to change their habitation; they remove in numbers from one country to another, 190.

Laplanders, one of the first distinct races of men round the polar regions; description of their persons and manners; have in every family a drum for consulting the devil; Gustavus Adolphus attempted in vain to form a regiment of Laplanders; use skates to run and slide, and how; are all hunters; offer their wives and daughters to strangers, i. 240, 241; wants supplied, and riches derived from the rein-deer, ii. 80; manner of life, 82; boil milk, with wood-sorrel, and keeps it in casks under ground to be eaten in winter, 87; when the lemings draw up to fight, they form ominous prognostics from their arrangement, 211; happy when an army of lemings comes down among them; they then feast upon their flesh, which cats and dogs detest, 212.

Lapwing, a small bird of the crane kind, iii. 182; its arts to lead off men and dogs from their nests; their seasons of courtship, 186.

Lark, bird of the sparrow kind, iii. 143; the sky, the wood, or the tit lark distinguishable from other little birds by length of heel, and loud song; nest, number of eggs, and habits, 147; those that remain with us the year throughout are birds of passage in Sweden, 143, 144.

Lark, (*Sea.*) a small bird of the crane kind, iii. 182; breeds in this country, 184.

Lava, matter discharged by the eruptions of volcanoes, i. 47.

Laughter, in what manner produced, i. 194.

Launce, description of this fish, iii. 287.

Lauricocha, a lake wherein the river Amazons has its source, i. 89.

Lawrence, (*St.*) a river; its rise and source, i. 90; receives about forty rivers, 91; its cataract, 93.

Laws, one in the Orkney islands, entitling any person that kills an eagle to a hen from every house in the parish where killed, iii. 62.

Layer, the impression on the place where the stag has lain, ii. 68.

Layers of the earth regularly disposed, but not of the same kind in every place; enumeration of earth in a well dug at Amsterdam, and of another dug at Marly; a layer, as far as it extends, always maintains the same thickness; proceeding to considerable depths, every layer is thicker; are sometimes very extensive, and often found to spread over a space of some leagues in circumference, i. 29, 30; remarkable layers of earth round the city of Modena, 115.

Lead-mine, one in Flintshire, ii. 284.

Leather called shamois, made of the skin of that animal, and also from those of the tame goat, the sheep, and the deer, ii. 51.

Leather-harness devoured by the jackal, ii. 151.

Leaves, two of a fig-tree, by experiment, imbibed from the earth two ounces of water in five hours and a half, i. 82.

Leech, different kinds; its description; takes a large quantity of food; has no anus or passage to eject it from the body when digested; in what it differs from the rest of the reptile tribe; the leech used in medicine; a girl of nine years old killed by leeches; best way of applying leeches, iv. 130 to 132.

Legs, a man without them performed astonishing feats of dexterity, ii. 273.

Leming, a bold animal of the rat kind, native of Scandinavia; often pours down in myriads from the northern mountains, and, like pestilence, destroys all the productions of the earth; Laplanders believe they drop from the clouds; their description; they move, in a square, forward by night, and lying still by day; whither their motions are turned nothing can stop them; a fire, a deep well, a torrent does not turn them out of their direction; they never retreat; interrupted by a boat across a river, they go over it; stopped by a stack of hay or corn, they gnaw their way through; and obstructed by a house they cannot get through, continue before it till they die; eat nothing prepared for human subsistence; never enter a house to destroy provisions; passing through a meadow, destroy it in a short time, and leave it with the appearance of being burnt up and strewed over with ashes; a man imprudently attacking one of them, the animal furiously flies at him, barking something like a puppy, fastens and does not easily quit its hold; their leader forced out of the line after a long defence, and separated from the rest, sets up a plaintive cry, not of anger, and hangs itself on the fork of a tree; they destroy and devour each other; after incredible devastations, they separate into armies, opposed with deadly hatred, and move along the coasts of the larger lakes and rivers; the Laplanders form prognostics from the manner of their arrangement; what prognostics; the divisions; continue their engagements and animosity until one party be overcome, then they disappear; and it is supposed, that having nothing to subsist on, they devour each other; their carcasses sometimes infect the air for miles round, and produce malignant disorders; they seem also to infect the plants, the cattle often dying in the places where they passed; the male larger, and more beautifully spotted than the female; are extremely prolific; breeding does not hinder their march, some carry one young in their mouth and another on their back; are greatly preyed upon by the ermine, and even by the rein-deer; dogs and cats detest their flesh, but the Laplanders esteem it good eating, and devour it greedily, ii. 210 to 213.

Leo, the emperor, granted the nations in possession of the shore, the sole right of fishing before their respective territories, i. 96.

Leopard, the American, is neither so fierce nor so valiant as that of Africa and Asia, i. 284; leopard will not fly at the approach of the lion, ii. 110; the large, and the leopard or panther of Senegal; differences between these animals, 120.

Lepadogaster, description of this fish, iii. 287.

Leprosy, in what manner the Indians endeavour to prevent the Arabian leprosy, or the elephantiasis; a disease to which man and the elephant are equally subject, ii. 278.

Lerot, the middle dormouse according to Mr. Buffon, ii. 207.

Leymmer, a dog of the generous kind, ii. 152.

Libella, the dragon fly; general characteristics; eggs; food of the young; how they prepare to change from the reptile to the flying state; description; the strongest and most courageous of all winged insects; the business of impregnation how performed, iv. 133 to 136.

Liboya, the greatest of the serpent kind, iv. 84.

Lichen rangiferinus, the food of the rein-deer, a moss in Lapland of two kinds, the white in the fields, and the black on the trees, ii. 82 to 84.

Lidme, name of the eleventh variety of gazelles, by Mr. Buffon, ii. 55.

Life, formerly supposed producible only by oviparous and viviparous generation, but later discoveries induce many to doubt whether animal life may not be produced merely from putrefaction, i. 168; the beginning of our lives, as well as the end, is marked with anguish, 178; that of infants very precarious till the age of three or four; instances of it, 182; the duration of life in general nearly the same in most countries, 136; the most useless and contemptible of all others the most difficult to destroy, iv 214.

Light, the hand exposed to broad day-light some time, then immediately snatched into a dark room, will still be luminous, and remain so for some time, and why; dangerous to the sight to look steadily upon bright and luminous objects, and why; such persons as read or write for any continuance should choose a moderate light, i. 220.

Light sent forth by the glow-worm, how produced, hitherto inexplicable, iv. 201; sent forth by the star-fish resembles that of phosphorus, 214.

Lightning, is an electrical flash produced by the opposition of two clouds, i. 149; of the torrid zone not so fatal or so dangerous as with us, otherwise those regions would be uninhabitable, 152; flashing without noise illuminates the sky all round in the torrid zone, 151.

Lights, northern lights illuminate half the hemisphere. i. 151.

Limbs, of the inhabitants near the poles are sometimes frozen and drop off; some animals live without, and often are seen to reproduce them, iv. 212.

Lime, manner of making it in Persia, i. 41.

Line, upon the approach of winter months under the line, the whole horizon seems wrapt in a muddy cloud, i. 151; in America, all that part of the continent which lies under the line is cool and pleasant, 247; in general, as we approach the line, we find the inhabitants of each country grow browner, until the colour deepens into perfect blackness, 248.

Linnæus, the celebrated naturalist, supposes man a native of the tropical climates, and only a sojourner more to the north; argument to prove the contrary, i. 250; his method of classing animals, 272; makes the female of the bat, *a primas*, to rank in the same order with man, ii. 230.

Linnet, a bird of the sparrow kind, iii. 142; taught to whistle a long and regular tune, 153.

Lion, to compare the strength of the lion with that of man, it should be considered that the claws of this animal give a false idea of its power, ascribing to its force what is the effect of its arms, i. 202; does not willingly attack the horse, and only when compelled by the keenest hunger; combats between a lion and a horse in Italy; the lion stunned and left sprawling, the horse escapes, but the lion succeeding, sticks to its prey, and tears the horse to pieces instantly; leaps twenty feet at a spring, 279 to 281; produced under the burning sun of Africa, is the most terrible and undaunted creature; he degenerates when removed from the torrid zone, ii. 105; description of this noble animal; a single lion of the desert often attacks an entire caravan; he crouches on his belly, and continues so with patient expectation, until his prey comes within a proper distance; the female has no mane; his roaring is so loud, that when heard in the night, and re-echoed by the mountains, it resembles distant thunder, 107 to 110; in countries tolerably inhabited, the lion is cowardly, and often scared by the cries of women and children, 101; attends to the call of the jackal, 152.

Lions, those of mount Atlas have not the strength or ferocity of those of Bildulgerid or Zaara; species of this animal diminishing daily; Mr. Shaw observes, the Romans carried fifty times as many lions from Lybia in one year, for their amphitheatres, as are in the whole country at this time; the same remark made with regard to Turkey, Persia, and the Indies, where lions diminish in their number daily; those inhabiting the peopled countries of Morocco, or India, scared away with a shout; the keepers play with him, plague, and chastise him, without a cause, he bears it with composure, but his anger once excited, the consequences are terrible; an instance from Labat; numberless accounts assure his anger noble, his courage magnanimous, and his natural ferocity seldom exerted against his benefactors; he has spared the lives of those thrown to be devoured by him, afforded them part of his subsistence, and sometimes abstains from food himself to support them; necessity alone makes him cruel; the manner of hunting them by Hottentots and others; reported that he sustains hunger a long time, but thirst he cannot support; some believe him in a continual fever; he drinks as often as he finds water, and laps it; he requires about fifteen pounds of raw flesh in a day; he rather hunts for a fresh spoil, than returns to that he had before; his breath is offensive, and his urine insupportable; horses for hunting them of that sort called charossi, all others fly at the sight of him, ii. 106 to 110; the lion prefers the flesh of camels to other food; is also fond of that of young elephants; when old, finding men and quadrupeds together, he attacks the latter, and never meddles with men, unless provoked; manner of copulation, time of gestation, number brought forth, and time taken to come to perfection, all known; a lion in the Tower of Loudon above seventy years; the lioness fearing her retreat discovered, hides her tracts by running back, or brushing them out with her tail; becomes terrible with young ones to provide for; lions, incited by desire, fight bloody battles, till one becomes victorious over the rest; the size of the lion between three and four feet; the female, in all dimensions, about one third less; there are properly no lions in America; the *puma* has received the name of the *American lion*, but when compared, is a very contemptible animal, 111, 112

Lion-cat, or *Angora-cat*, a beautiful animal, a native of Syria and Persia, ii. 105

Lion, (*Sea*) described in Anson's voyages, regarded as the largest of the seal family 246.

Lipidopus, the garter-fish, its description, iii. 237.

Lips, those of the hare and of the squirrel continually move, whether sleeping or waking, ii. 177.

Litters, in all animals, intermediate litters most fruitful; first and last generally produce fewest and weakest of the kind, i. 286.

Littorales, Latin name for those shells that are cast upon shore, iv. 27.

Liver of a shark affords three or four quarts of oil, iii. 264.

Lizards, along the coasts of Guinea their flesh esteemed a delicacy, ii. 137; differs from every other class of animals, and from each other, iv. 62 to 64; whence the greatest distinction; general characteristics; the water-kind changes its skin every fourth or fifth day; sprinkled with salt, the whole body emits a viscous liquor, and the lizard dies in three minutes, in great agonies; whole of the kind sustain the want of food in a surprising manner, 74.

Lizard (*Chalcidion*) of Aldrovandus described, iv. 78.

Lizard (*flying*) of Java, account of it by Gentil, iv. 78.

Loach, a description of this fish, iii. 286.

Lobster, a ruminating fish, ii. 28; very voracious, though without warmth in its body, or red blood in its veins; whatever it seizes upon and has life perishes, however well defended; they devour each other, and, in some measure, eat themselves, changing their shell and stomach every year; the old stomach is the first morsel to glut the new; at first sight, the head may be mistaken for the tail; its description; the food of the young; the moulting season; how they change their shells; many die under this operation; speedy growth of the new shell; and of itself after the change; the claws of unequal magnitude, and why; at certain seasons they never meet without an engagement; wonders this extraordinary creature offers to imagination; are endowed with a vital principle that furnishes out such limbs as have been cut away; varieties of this animal with differences in the claws, little in the habits or conformation; the shell black when taken, but turns red by boiling; common way of taking the lobster, iv. 6 to 9.

Locust, the great brown locust seen in several parts of England in 1748; in some southern kingdoms they are still formidable; description of this insect; in what manner they take the field; their devastations; are still more noxious when dead; instance of it; account of their devastations in Russia, Poland, Lithuania, and Barbary; transformations; eaten by the natives in many kingdoms of the East, and caught in small nets for that purpose; their taste; are considered as a great delicacy in Tonquin, by the rich and the poor; must have been a common food with the Jews; description of the great West Indian locust, the most formidable, iv. 75 to 77.

Loir, the greater dormouse, so called by Mr. Buffon, ii. 207.

Longevity, persons remarkable for it, i. 235.

Lorensini, his experiments upon the torpedo, iii. 271.

Lori, the longest of all animals, in proportion to its size; description; a native of the island of Ceylon, ii. 269.

Loricaria, description of this fish, iii. 288.

Lories, a kind of parrot, iii. 127.

Louse, its description; whether distinguished by the parts of generation into males and females, not yet discovered; the lousy disease frequent among the ancients, iv. 119, 120.

Louse (*wood*,) the description; of great use in medicine, iv. 123.

Lewenhoek, his opinion about the rudiments of animals, i. 167.

Luminous appearance of the waves in the night, the cause, i. 102.

Lump-fish, its description; flung into a pail of water, will stick so close to the bottom, that on taking the fish by the tail, the pail and several gallons of water may be lifted; their flesh, ii. 274.

Lungs, animals before birth make no use of their lungs, ii. 242; no anatomist has described the lungs of the lamprey, iii. 272; caterpillars have eighteen lungs, and live several days in the exhausted receiver of the air-pump, iv. 221.

Lybia, its inhabitants use ostriches as horses; also at Joar; instance of it at the factory of Podore, iii. 50.

Lyboija of Surinam, a kind of serpent, thirty-six feet long, iv. 84.

Lynx, distinguished from the ounce, and described; first striking distinction between it and those of the panther kind is the tail; each hair of this animal is of three different colours; it is not above the size of the ounce; chiefly met with in the cold countries bordering on the pole, in the north of Germany, Lithuania, Muscovy, Siberia, and North America; those of the New Continent are smaller than in Europe; this animal has been called the *lupus cervarius*, but for what reason hard to guess; in its nature it exactly resembles the cat, is bigger, and near two feet long, is also bolder and fiercer; more delicate than the cat; resembles the wolf in nothing except its cry, several reports of the lynx, propagated by ignorance or imposture, ii. 121 to 125.

Lyster, strangeness of his theory to explain the invariable motion of winds, i. 137

Lythophites and coraline substances, iv. 220.

M.

Macaguo, a kind of monkey described by Mr. Buffon, ii. 266.

Macaw, the large kind of parrot, the size of a raven, iii. 127.

Machineel-tree. in America, its shade fatal, i. 131; no plant will grow under it, i. 162

Machines, the invention of many has rendered human strength less valuable, i. 205.

Mackarel produces five hundred thousand eggs in one season, iii. 239; described, 285; its growth, 297.

Madagascar, its natives desire nothing so ardently as to prostitute their wives or daughters to strangers, and for the most trifling advantages, i. 188; the great bat of that island described, ii. 231.

Madder. See *Blood*, i. 233.

Madness, produced by want of sleep, i. 210; cured by music, and also caused by it. See *Henry IV*. i. 224.

Maelstroom, Dutch name for a whirlpool; one upon the coast of Norway, considered as most dreadful and destructive: the body of water forming this whirlpool, extended in a circle of above thirteen miles, i. 109, 110.

Magellan (*Ferdinand*,) a Portuguese of noble extraction, first discovered the gigantic race of mankind, towards the extremity of South America; account of this discovery; he was slain upon one of the Molucca islands, i. 257.

Magni, an Italian traveller, discovered the remarkable grotto of Antiparos, in the Archipelago, i. 33.

Magot of Buffon, the cynocephalus, the last of the ape kind; its description, ii. 256.

Magpie, thievish; rings found in the nest of a tame magpie, iii. 108; habits and food; when satisfied for the present it lays up the remainder for another time; places where it builds, and nests described; number of eggs; in its domestic state, preserves its natural character strictly; foolish custom of cutting its tongue to teach it to speak puts the animal to pain, and baulks the intention, 114, 115.

Mahometans, considering the hare as an unclean animal, religiously abstain from its flesh, ii. 183.

Maimon, the last of the baboons, Edwards calls it the *pigtail*; its description, native of Sumatra; does not well endure the rigours of our climate, ii. 229.

Maire (*James Le*,) a traveller, who confirms the existence of giants in America, i. 258.

Maki, the last of the monkey kind, ii. 235; their description; many different kinds of these animals, 268, 269.

Malabar, land and sea-breezes upon those coasts, i. 141.

Malacopterigii, the barbarous Greek name given to the soft-finned fish; the prickly finned sort termed *Acanthopterigii*, iii. 283.

Malahallo, a very considerable volcano in South America, i. 45.

Malbranche, grounds his beautiful theory of monstrous productions upon a famous instance related by him, and some theory from which he deduces the effects of imagination upon the fœtus, i. 251.

Malbrouk, a monkey of the ancient continent; its description; the Bramins have hospitals for such as are sick or disabled, ii. 266.

Maldivia Islands have land in them at one time covered with water, and at another free, i. 114.

Mallard, a kind of duck, iii. 221; with very particular faculties for calling, 223.

Malpighi, his famous experiment upon the stigmata of caterpillars, iv. 157.

Mammouth, its tusks, which are used as ivory, and supposed to belong to the elephant, often weigh four hundred pounds, ii. 284.

Man endures a greater variety of climates than the lower orders are able to do, and why, i. 129; differences in his species less than in animals, and rather taken from the tincture of the skin than variety of figure; there are not in the world above six distinct varieties in the race of men; first race in the polar regions, deep brown, short, oddly shaped, savage; second, the Tartar race, olive-coloured, middle-sized, ugly, robust; third, the southern Asiatics, dark olive, slender shaped, straight black hair, feeble; fourth, the negroes of Africa, black, smooth skin, woolly hair, well shaped; fifth, the Americans, copper colour, straight black hair, small eyes, slight limbed, not strong; sixth, the Europeans and bordering nations, white, and of different tints, fine hair, large limbed, vigorous, 239 to 247; may be called the animal of every climate, 164; intended naturally to be white, 247; white men resemble our common parent more than the rest of his children; a native of the tropical climates, and only a sojourner more to the north, according to Linnæus; argument sufficient to prove the contrary, 249, 250; marriageable in the warm countries of India at twelve and thirteen years of age, 255; just come into the world gives a picture of complete imbecility, 179; vain man ventures to excite an auditor's attention, at the risk of incurring his dislike, 197; as man has a superiority of powers over other animals, so is he proportionably inferior to them in his necessities; nature has made him subject to more wants and infirmities than other creatures, but all these wants seem given to multiply the number of his enjoyments; and in what manner, 206; first sensations of a man newly brought into existence, and the steps by which he arrives at reality pointed out by Mr. Buffon, 230; the only animal that supports himself perfectly erect; the buttock, in man, different from that of all other animals; man's feet also different from those of other animals, the ape's not excepted; the nails less in man than in any animal, 199; said to be tall when from five feet eight inches to six feet high, 200; probability that men have been, in all ages, much of the same size they are at present, 259; proportionably stronger for his size than any other animal; to compare the strength of the lion with that of man, it must be considered the claws of the animal give a false idea of its power, and ascribe to its force the effects of its arms; another manner of comparing the strength of man with that of animals, is by the weights which either can carry; Dr. Desaguliers speaks of a man able to raise two thousand pounds, by distributing the weights in such manner that every part of his body bore its share, 202; exercised in running, outstrips horses; a stout walker, in a journey, walks down a horse; those employed as messengers at Ispahan, in Persia, runners by profession, go thirty-six leagues in fourteen hours, 203; every animal endures the wants of sleep and hunger with less injury to health than man, 206; he cannot, uninjured, live four days without eating, drinking, and sleeping, 207; one said to live without food for seven days, 209; requires sleep for double motives, the refreshment of the mental as well as the bodily frame, 210; more difficult for man than any other animal to procure sleep, 211; has a lump upon the windpipe not to be seen in women, 198; a young man deaf and dumb from his birth, knew nothing of death, and never thought of it till the age of twenty-four, when he began to speak all of a sudden, 226; account of a man ruminating, ii. 29; in those countries where men are most barbarous and stupid, there brutes are most active and sagacious, 266; one, without hands or legs, by practice used his stumps for the most convenient purposes, and performed astonishing feats of dexterity, 273; man dies under wounds which a quadruped or a bird could easily survive, iv. 212.

Manufactures, the woollen manufacture not carried on here till several ages after sheep were propagated in England; unavailing efforts of our kings to introduce and preserve it; the Flemings possessed the art in a superior degree; the inhabitants of the Netherlands improved us in this art, and when; the woollen-manufacture supposed for some time decaying among us, ii. 42; of stuffs of the wool of the pacos, a considerable branch of commerce in South America, iii. 11.

Manati, may indiscriminately be the last of beasts, or the first of fishes; its description; the female has breasts placed forward like those of women; the tongue so short, some have pretended it has none; never entirely leaves the water; only advances the head out of the stream, to reach the grass on the river sides; it feeds entirely on vegetables; places where found; graze among turtles and other crustaceous fishes, giving or fearing no disturbance; unmolested they keep together in large companies, and surround their young; bring forth in autumn; and supposed to go with young eighteen months; the manati has no voice nor cry; its intestines are longer in proportion than those of any other creature, the horse excepted; the fat which lies under the skin, exposed to the sun, has a fine smell and taste, and exceed the fat of any sea animal; the heat of the sun does not make it rancid; it tastes like the oil of sweet almonds, and serves every way instead of butter; any quantity may be taken inwardly, having no other effect than to keep the body open; the fat of the tail, boiled, more delicate than the former; the lean takes a long time in boiling, and eats like beef; the fat of the young like pork, and the lean like veal, ii. 247, 248.

Mandril, the largest of the baboon kind; its description, when displeased, weeps like a child; is a native of the Gold Coast, ii. 259.

Mangabey, a monkey of the ancient continent; its description, ii. 266.

Mangrove-tree, that grows down in the water of the Senegal river, i. 91.

Manks-puffin or *coulterneb*, a small water-fowl, described, iii. 210 to 212.

Mares, their exportation; prohibited by law in Arabia, ii. 10; studs in Persia of ten thousand white mares, with hoofs so hard, that shoeing is unnecessary, 10; a law in England, prohibiting the exportation of mares and stallions; and one similar to this obtained so early as the time of Athelstan, 15.

Marikina, a monkey of the sagoin kind, with a mane round the neck, and a bunch of hair at the end of the tail, like a lion, ii. 268.

Marmose, only differs in size from the opossum, being less; instead of the bag is receive the young, has only two longitudinal folds, within which the premature young continue to suck; when first produced not above the size of a bean; but stick to the teat until they arrive at maturity, ii. 271, 272.

Marmot, or *marmotte*, a ruminating animal, ii. 28; a native of the Alps; its description; is easily tamed, readily taught to dance, wield a stick, and obey the voice of its master; it has an antipathy to the dog; strength and agility; ludicrous saying that the Savoyards, the only chimney-sweepers of Paris, have learned their art from the marmotte they carry about for show; is apt to gnaw the furniture; other affections of this animal; its food; is cleanly, but has a disagreeable scent; sleeps during winter; form of its hole resembles the letter Y; manner of making it; they live together, and work in common to make their habitations snug and convenient; when they venture abroad, one is placed as sentinel upon a lofty rock; Mr. Buffon says it does not sleep during winter, is rather in a torpor, a stagnation of all its faculties; its heat not more than ten degrees above congelation; the flesh said to have a wild taste, and to cause vomiting; countries where it is found; inhabitants of the Alps do not till winter open its hole; produces but once a-year, and brings forth three or four at a time; they grow fast, and their lives not above nine or ten years, ii. 192 to 195.

Marriage, and consummation of the Indians, the husband at ten years old, and the wife at eight; frequently have children at that age, i. 144.

Marriotte, his experiment proves that water acts as a menstruum upon air, i. 148.

Marrow, spinal, and the brain, the first seen as begun in the embryo, i. 214.

Marsigli, (*Count*) his opinion upon corals and sponges, iv. 221.

Martin, its description; the most beautiful of all British beasts of prey; its scent a pleasing perfume; the yellow-breasted martin; its fur more valuable than the white-breasted sort; Mr. Buffon supposes them a distinct species; that distinction unnecessary; of all the weasel-kind the most pleasing, ii. 163; feed as they do, and is fond of honey, 160; seldom meets the wild cat without a combat; the wild cat not a match for the martin; kept tame by Gesner and Mr. Buffon; often slept for two days, and then was two or three days without sleeping; the yellow-breasted more common in France than England; in that retreat the female brings forth her young, three or four at a time, and they come with their eyes closed; how she compensates for her deficiency of milk; this animal more common in North America than in Europe, found in all northern parts of the world, from Siberia to China, and Canada; small birds alarm the spot where the dam keeps her young, and direct the hunter in his pursuit; the white-breasted keeps near houses and villages; the yellow in woods; leads a savage life, 163 to165; its nest generally the tenement of the squirrel, taking possession and killing the owner, 189; seizes also the flying squirrel, 191.

Martin, a bird of the swallow tribe, iii. 153.

Mastiff, one of the three descendants of the shepherd's dog, ii. 131; chiefly a native of England; when transported into Denmark, becomes the little Danish dog, 132; the Dutch mastiff, 132.

Mastiff-fox, second variety of foxes, less than the grey-hound fox, ii. 150.

Maturity, attained to by slow steps, announces a slow march to old age; as true to other animals as to man and vegetables, i. 235; sooner arrived at in India than in Europe, 230.

Maw, in fishes, possess the power of digesting, iii. 234.

Maximin, (*the Emperor*) a prodigy of strength; several instances of it; by birth a Thracian; from being a simple herdsman he rose by the gradations of office, until he became Emperor of Rome; was above nine feet in height, and the best proportioned man in the empire; was killed by his own soldiers, while sleeping, i. 204, 205.

May-bug, or dor-beetle, described, iv. 198. See *Beetle*.

Measled hares, distinguished from mountain hares, ii. 181.

Mechanism, which regulates the number of our years, admits no change in its laws, and can be affected only by long fasting, or great excess, i. 236.

Madauro, the brass helmet dug up there fits a common man, yet is allowed to have been left there at the overthrow of Asdrubal, i. 259.

Media has pastures in its plains, excellent for rearing horses, ii. 12.

Mediterranean sea, always receiving, and never discharging water, is no way fuller than before; in what manner some account for this, i. 108; water spouts seen in it; description of them by Tournefort; solutions offered for this phenomenon by Mr. Buffon and Dr. Stuart, 156 to 157; this sea one of the smoothest and most gentle in the world, 109.

Medusa, name given by Linnæus to a small insect, thought the simple food of the great Greenland whale, iii. 247.

Meibomius, has collected some few remains of ancient music, which do not leave room to regret what is lost, i. 223.

Membrane, the nictitating membrane in birds; veils the eye at pleasure, iii. 30.

Mendip Mines, in Somersetshire, account of them by Mr. Locke, i. 37.

Menstruum, Mariotte's experiment shows that water will act as a menstruum upon air; cold diminishes the force of menstruums, and often promotes evaporation, i. 147, 148.

Merlin, the smallest of the hawk or falcon kind; displays a degree of courage rendering him formidable to birds far above his size, iii. 73.

Metals, the richest, in their native state, much less glittering and splendid than useless marcasites, i. 36; those trades that deal in their preparations, always unwholesome, 131; all pieces swallowed by animals lose part of their weight, and often the extremities of their figure, iii. 47.

Meteors, between the tropics, and near the poles, assume dreadful and various appearances, i. 150; one of a very uncommon kind, seen by Ulloa, at Quito, 153.

Method, the principal help in natural history; the author's method of classing them; Mr. Locke has observed, that a drawing of an animal, taken from life, is the best method of advancing natural history, i. 268 to 275.

Mew, said of stags when they cast their heads, ii. 68.

Mice, have burrowed in the backs of hogs, while fattening in the sty, without being felt, ii. 91; in 1580, at Hallontide, an army of mice overrun the marshes near Southminster, and eat up the grass to the roots; but soon after they were all devoured by a number of strange painted owls, iii. 82.

Mico, the least and most beautiful monkey of the sagoin kind, ii. 268.

Microscope increases the magnitude of an object, and that of its motion also, i. 168.

Migrating fishes, iii. 292. See ***Fishes***.

Migration, causes of migration of birds; in what manner they perform them; at what times, iii. 38 to 40; of bees, several signs previous to it, iv. 181.

Milk, infants have it in their own breasts, i. 182; sometimes found in the breasts of men, as well as in those of women, 182; of goats medicinal, and not apt to curdle upon the stomach as that of the cow, ii. 46; of the rein-deer thinner than that of the cow, but sweeter and more nourishing, 84; injected into a vein, kills with more certainty than the venom of a viper, iv. 93.

Milipides, multiplied by being cut in pieces, i. 169.

Milo, an instance of his strength, when stood upright, i. 204.

Milton makes Satan personate the cormorant, a most nauseous bird, iii. 198.

Minerals. mere inactive and insensible bodies, i. 162.

Miners first become paralytic, then die consumptive, for the trifling reward of sevenpence a day, i. 38; peculiar contrivance to supply light for their operations, 39.

Mines, the deepest that at Cotteberg, in Hungary, not more than three thousand feet deep, i. 27; a coal-mine of the North of England said to be eleven hundred yards deep, 36; air different in them, proportionably as the magazines of fire lay nearer the centre; other causes of this difference; Mendip lead-mines in Somersetshire; their description, 36, 37; mines of coal generally less noxious than those of tin; tin than those of copper; but none are so dreadfully destructive as those of quicksilver; deplorable infirmities of workmen in the mines near the village of Idra, 38; metallic often destroys all vegetation by their volatile corrosive fumes; salt mines naturally cold, 40; natives of countries abounding in mines too often experience the noxious effects of their vicinity, 131; in a lead-mine, in Flintshire, were found two grinding teeth, and part of the tusk of an elephant, at forty-two yards depth, ii. 284.

Mingrelians, among the sixth variety of the human species, described, i. 246.

Mire-drum, the bittern, described, iii. 174. See *Bittern*.

Mistletoe, a plant, thought propagated by seeds voided by birds, iii. 143.

Mississippi, a great river in North America; its source and length, i. 90.

Mists, continually rise upon the approach of the winter months under the line, ii. 51; called frost smoke, raises blisters on the body, in the regions round the poles, 151

Mite-fly, not found in Lapland, ii. 86.

Miume, a river in America; enormous skeletons lately discovered near it, ii. 285.

Mock-bird, description of the American mock-bird; its habits; can assume the tone of every animal in the wood, from the wolf to the raven, iii. 145.

Mock-suns, meteors, and other phænomena, in the northern regions, i. 151.

Mococo, first of the maki-kind. which is the last of the monkeys; its description a native of Madagascar; its qualities, ii. 269; eats its own tail, iii. 18.

Modena; a city in Italy; its remarkable wells; other rarities round it, i. 115.

Mould, black, or garden-earth, the first layer on the surface of the globe; is formed from animal and vegetable bodies decayed; soil fertile, in proportion to the quantity that putrified mould bears to the gravelly mixture, i. 28.

Mole, a ruminating insect, or seemingly so, ii. 28; an utter stranger in Ireland; its description; the ancients, and some moderns of opinion that the mole was blind; but Derham, by a microscope, discovered all the parts of the eye known in other animals; description of the mole-hill in which the female has brought forth her young; is scarcely found, except in cultivated countries; the varieties are but few; that of Virginia is black, mixed with a deep purple; that of Poland is white; Agricola says, he saw hats made of mole-skins, the finest and most beautiful imaginable, ii. 213 to 216.

Molossian breed of dogs, and its perfections, set forth by Nemesianus, ii. 135.

Molting, annually suffered by birds; its effects, iii. 33; artificially accelerated, and how; the manner in which Nature performs the operation, 34.

Molucca islands, Ferdinand Magellan slain upon one of them, i. 257.

Mona, the *cephus* of the ancients, a monkey of the ancient continent, ii. 267.

Monax, name given to the marmout in Canada, ii 196.

Mongoose one of the maki-kind, the last of the monkeys; its description, ii. 269.

Monkey, they sometimes fall a prey to the lion in deserts and forests, ii. 109; La Condamine asserts it would take up a volume to describe the difference of monkeys found along the river of Amazons; and we are sure that every one of these is different from those on the African coast; the tiger, nor the lion, will not venture to dispute dominion with creatures, who from the tops of trees with impunity carry on an offensive war, and by their agility escape all pursuit; birds have not less to fear from their continual depredations; such being their petulant delight in mischief, that they fling the eggs against the ground when wanting appetite to devour them; one only animal in the forest ventures to oppose them; that is the serpent; large snakes often wind up the trees where they reside, and happening to surprise them sleeping, swallow them whole, before they can make a defence, 260 to 262; they regularly begin hostilities against those who enter their woods; one being wounded, the rest come round, put their fingers into the wound, as desirous of sounding its depth; the blood flowing in any quantity, some stop it, while others get leaves, chew, and thrust them into the opening; are often killed in numbers before they make a retreat; in this retreat the young are clinging to the back of the female, who jumps away, seemingly unembarrassed by the burden; usual way of taking them alive; skinned and served up at negro feasts, so like a child, an European is shocked at the sight; the negroes seeing Europeans buy young and tame monkeys, with equal care brought rats to the factors for sale, and were greatly disappointed at finding no purchaser, 262 to 264; manner of carrying their young in the woods; dexterity in passing from one tree to another, by forming a kind of chain, locking tail to tail, or hand in hand; faithful services which Father Carli received from the monkeys in Angola, where he went to convert the savage natives to Christianity; savages of Africa and America suppose monkeys to be men, idle, slothful, rational beings, capable of speech and conversation, but obstinately dumb, for fear of being compelled to labour, 265 to 268.

Monkey-bezoar, a factitious concrete, ii. 54. See *Bezoar*.

Monoculus, the arborescent water-flea; its description, iv. 124.

Monsoons, so called from a famous Pilot of that name, who first used them in navigation with success, i. 139; monsoons prevail at different seasons throughout the Indies, i. 144.

Monsters, after a catalogue of them, Linnæus particularly adds the slender waists of the women of Europe, i. 251.

Monstrous productions, Father Malbranche's ingenious theory of; remarkable instance related by him, i. 252.

Moose-deer, name in America for the elk, ii. 78; its description, 79.

Mormyrus, description of this fish, iii. 288.

Morocco, the original horses there, much smaller than the Arabian breed, ii. 12.

Moron, a kind of salamander, thought venomous, iv. 72.

Morse, an animal of the seal-kind, might be ranked among the fishes, i. 277; resembles a seal, except that it is much larger; its teeth generally from two to three feet long; the ivory more esteemed than that of the elephant, ii. 246.

Moschetoes, excessive torments caused by them, i. 63.

Moss, the only support of the rein-deer in Lapland; of two sorts, ii. 83.

Mother-of-pearl, taken from the pearl oyster, iv. 42.

Moths, difference from butterflies, iv. 165.

Motion keeps the water of the sea sweet, i. 102; destroys numbers of viler creatures, 103; constant motion of the waters of the sea westward, 106; principal difference between serpentine and vermicular motion, iv. 87; some vegetables possessed of motion, 209; and many animals totally without it; in what manner animals of the worm kind move, 211.

Moufflon, the sheep in a savage state, a bold, fleet creature, able to escape from greater animals, or oppose the smaller; its description, ii. 41.

Mountains, rising from places once level, i. 59; give direction to the course of the air, 136; how formed, and for what designed; upon our globe considered as angles of small lines in the circumference of a circle, 60, 61; countries most mountainous, are most barren and uninhabitable, 64; some valleys are fertilized by earth washed down from great heights, 70; the more extensive the mountain, the greater the river, 62; tops of the highest mountains bare and pointed, and why, 67; tops of land-mountains appear barren and rocky, of sea-mountains verdant and fruitful, 118; the highest in Africa, those called *of the moon*, giving source to the Niger and Nile in Africa; the greatest and highest under the line; some rise three miles perpendicular above the bottom of the ocean, 63, 64; highest in Asia; Mount Caucasus makes near approaches to the Andes in South America, 66; burning in Europe, 42; in Asia; in the Molucca Islands; in Africa; in America; those of the Andes; those of Arequipa, Carassa, Malahallo, and Cotopaxi, 45; description of the latter by Ulloa, and an eruption of it, 46.

Mouse, the most feeble, and most timid of all quadrupeds, except the Guinea-pig; no animal has more enemies, and few so incapable of resistance; the owl, cat, snake, hawk, weasel, and rat, destroy them by millions; Aristotle, having put a mouse with young into a vessel of corn, some time after found a hundred and twenty sprung from that original, ii. 133, 134.

Moustoc, or *white-nose* monkey of the ancient continent; description, ii. 267.

Mucous liquor, giving the joints an easy and ready play, i. 233.

Mugil, the mullet, description of this fish, iii. 268.

Mule, reputed barren, though Aristotle says it is sometimes prolific, ii. 17; engendered between a horse and a she-ass, or a jack-ass and a mare, 21; common mule very healthy; lives thirty years and more, 21; in South America destroyed by a bat called vampyre, 233.

Mullus, or *surmulet*, a description of this fish, iii. 286.

Multivalve shells, third division of shells by Aristotle, iv. 27; two principal kinds of multivalve shell-fish, moving and stationary, 44.

Mummy, formerly a considerable article in medicine; Paræus wrote a treatise on the inefficacy of mummy in physic; counterfeited by the Jews, and how; the method of seeking for mummies; found in the sands of Arabia; in Egypt, in wooden coffins, or in clothes covered with bitumen, i. 264, 265; remarkable mummy dug up at Auvergne, in France, 266.

Muræna, the eel, its description, iii. 287.

Murena of the ancients, not our lamprey, iii. 271.

Muralto. See *Lamprey*, iii. 272.

Muscardin, name of the lesser dormouse, by Mr. Buffon, ii. 207.

Muscles, to judge of the strength of animals by the thickness of their muscles, inconclusive, i. 205; in quadrupeds, as in man, the muscles moving the thighs and hinder parts are strongest, while those of the arms are feeble; in birds, the contrary obtains, iii. 30; those of the shark preserve their motion after being separated from the body, 263.

Muscle, the shell-fish, its description, iv. 37 to 39.

Muscovy duck, or *musk duck*, so called from a supposed musky smell, iii. 221.

Music, said, by the ancients, to have been invented from the blows of different hammers on an anvil; all countries pleased with music, and where they have no skill to produce harmony, they substitute noise; its effects; the ancients give us many strange instances of them upon men and animals; and the moderns likewise; madness cured by it; and also excited by it; remarkable instance in Henry IV. of Denmark; fishes are allured by music; horses and cows likewise, i. 222 to 225; the elephant appears delighted with music, ii. 276; Father Kircher has set the voices of birds to music, iii. 81

Musk, among the numerous medicines procurable from quadrupeds, none, except the musk and hartshorn, have preserved a degree of reputation, ii. 52; a doubt whether the animal producing it be a hog, an ox, a goat, or a deer; it comes from China, Tonquin, Bengal, and often from Muscovy; that of Thibet reckoned the best, and of Muscovy the worst, 58 to 60.

Musk-rat, three distinctions of it, ii. 135.

Musky smell does not make the characteristic marks of any kind of animals, ii. 38.

Musmon or *mufflon*, resembles a ram; its description, ii. 44.

Myoides, a broad, thin skin, covering the whole upper fore-part of the body, its effect in women with child, i. 199.

N.

Nails, how formed in man; those of some of the learned men in China longer than their fingers; savages that let them grow long, use them in flaying animals, i. 198 to 200

Nanquin, a river in Asia, receives thirty rivers, i. 90.

Narwhale, the sea unicorn, its description; the most harmless and peaceful inhabitant of the ocean, iii. 251, 252.

Natonial Goat, a remarkable variety in the goat kind, ii. 47.

Nature, lavish of life in the lower orders of the creation, i. 179; has brought man into life with more wants and infirmities than the rest of her creatures, 206; in a course of ages shapes herself to constraint and assumes hereditary deformity; instances of it, 249; has contracted the stomachs of animals of the forest, suitable to their precarious way of living, 206; has left no part of her fabric destitute of inhabitants, iii. 27; what might have led some late philosophers into the opinion that all Nature was animated, iv. 222.

Nautilus, a sea-snail, most frequently seen swimming; its shell very thin, and easily pierced; its description, iv. 35.

Nazareth bird, whether the dodo or not is uncertain, iii. 56.

Neck, fishes have none; birds, in general, have longer than any other kind of animals, i. 198; in women, it is proportionably longer than in men, 200.

Nectareum, the part of a flower from which the honey is extracted, iv. 178.

Negroes of the Leeward Islands, by the smell alone, distinguish the footsteps of a Frenchman from those of a Negro, i. 227; their features not deformed by art; the women's breasts, after bearing one child, hang down below the navel, and are thrown over the shoulders to suckle the child at their backs, 245; the jet black claim the honour of hereditary resemblance to our common parent; an argument sufficient to prove the contrary; two white Negroes, the issue of black parents, 249, 250; of the African coasts regard the bat with horror, and will not eat it though ready to starve, 231; happy to see numbers of monkeys destroyed, because they dread their devastations, and love their flesh; distractedly fond of the flesh of the shark, iii. 263; their manner of killing it, iii. 264.

Negroland, or *Nigritia*, the plague not known in it, i. 132.

Nerves, wherever they go, or send their branches in number, these parts are soonest begun, and most completely finished, i. 215.

Ness, or *Nethe*, a river near Bruges, in Flanders; great quantities of trees found in its mouth, at the depth of fifty feet, i. 114.

Nest of every species of birds has a peculiar architecture; where eggs are numerous, the nest must be warm, iii. 35; description of the nest of an eagle found in the Peak of Derbyshire, 62; of the bald eagle, large enough to fill the body of a cart, 63; hanging nests in Brazil, 120; made in such a manner, as to have no opening but at the bottom, 121; that of the wasp one of the most curious objects in natural history; its description, iv. 186, 187.

Netherlands, their inhabitants improved us in the woollen manufacture, ii. 42.

Nettles, how used to teach capons to clutch a fresh brood of chickens throughout the year, iii. 97.

Nettles of the sea, name given by some to the star-fish, iv. 214.

Nicola Pesce, a celebrated diver; his performances related by Kircher; frequently known to spend five days in the midst of the waves, i. 119.

Nieper, or *Boristhenes*, a river rising in the middle of Muscovy, i. 87.

Niger, this river has a course of several hundred miles from its source, at the Mountains of the Moon, i. 62; confidently asserted that it is lost before it reaches the ocean, 93.

Nightingale, a bird of the sparrow kind, iii. 143; description of its melody by Pliny, its food, and in what manner they must be kept; manner of catching the nightingale, and of managing them when caught, 145 to 151.

Nile, its course; its sources ascertained by missionaries; the cause of its annual overflowings; time of their increase and decrease more inconsiderable now than in the time of the ancients, i. 88, 89.

Nose, that of the Grecian Venus, such as would appear at present an actual deformity, i. 188; the form of the nose, and its advanced position, peculiar to the human visage; a Tartar seen in Europe with little more than two holes through which to breathe, 193.

Nostrils, wide, add a great deal to the bold and resolute air of the countenance, i. 193; of the cetaceous tribe, iii. 242; two in the great Greenland whale, 246.

Notonecta, the common water-fly; swims on its back, to feed on the under side of plants growing in water, iv. 149.

Numidian bird, or Guinea-hen, described, iii. 98.

Numidian crane; its peculiar gestures and contortions, iii. 170.

Nux vomica, ground and mixed with meal, the most certain poison, and less dangerous to kill rats, ii. 204; fatal to most animals, except man, iii. 90.

Nyl-ghaw, an animal between the cow and the deer, native of India; its description, iii. 11, 12.

O

Oaks of Hatfield Chase Levels, as black as ebony, very lasting and close grained, sold for fifteen pounds a-piece, i. 116.

Objects. See *Eye.*

Oby, in Tartary, a river of five hundred leagues, running from the lake of Kila into the Northern Sea, i. 88; receives about sixty rivers, 91.

Ocean, occupies considerably more of the globe than the land; its different names; all the rivers in the world flowing into it, would upon a rude computation, take eight hundred years to fill it to its present height, i. 94; opinions concerning its saltness, and that of Boyle particularly, 97; winds never change between the tropics in the Atlantic and Ethiopic Oceans, 136.

Ocelot, or catamountain, its description, ii. 121; of the panther kind; one of the fiercest, and, for its size, one of the most destructive animals in the world, 124.

Ocolzimitzcan, a kind of pigeon, one of the most splendid tenants of the Mexican forests, iii. 135.

Ohio, several enormous skeletons, five or six feet beneath the surface, on the banks of that river, lately discovered, ii. 285.

Oil, the oil of the fish called cachelot is very easily converted into spermaceti, iii. 254; the porpoise yields a large quantity of it, 257; by the application of olive oil, the viper's bite is effectually cured, iv. 96.

Olive colour, the Asiatic, of that colour, claims the honour of the hereditary resemblance to our common parent, i. 250.

Oliver, (*William*) the first who discovered that the application of olive oil, cured the viper's bite effectually, iv. 96.

Onager, or the wild ass, is in still greater abundance than the wild horse, ii. 17.

Ondatra, one of the three distinctions of the musk-rat; this animal, in some measure, resembles the beaver; its manner of life during winter, in houses covered under a depth of eight or ten feet in snow; savages of Canada cannot abide its scent; call it stinkard; its skin very valuable, ii. 207, 208.

Onza, or ounce, of the panther kind; the onza of Linnæus, ii. 120.

Ophidium, the gilthead, by sailors called the dolphin, its description, iii. 284.

Opossom, the female's belly found double; when pursued, she instantly takes her young into a false belly nature has given her, and carries them off, or dies in the endeavour, i. 286; Ulloa has found five young hidden in the belly of the dam, alive and clinging to the teat, three days after she was dead; it often hangs by the tail, and for hours together, with the head downwards, keeps watching for its prey; by means of its tail, flings itself from one tree to another, hunts insects, and escapes its pursuers; during its gestation, the bag in which the young are concealed may be opened and examined without inconvenience; the young may be counted and handled; they keep fixed to the teat, and cling as firm as if they made a part of the body of the mother, ii. 270, 271.

Orb, description of the sea-orb, also called the sea-porcupine; is absolutely poisonous, if eaten, iii. 280.

Ore of tin is heavier than that of other metals, i. 36.

Organs of digestion in a manner reversed in birds, iii. 32.

Organs of generation in fishes, iii. 238.

Orifices, or different verges in snails, iv. 33.

Orkney Islands, on their shores, the sea, when agitated by storms, rises two hundred feet perpendicular, i. 111.

Oroonoko, a river in South America, its source and length, i. 90.

Ortolan, a bird of the sparrow kind, iii. 142.

Osprey, its flesh liked by many, and, when young, an excellent food, according to Belonius, iii. 59.

Ostiac Tartars, a race that have travelled down from the north, i. 242.

Ostracian, a fish of the cartilaginous kind, is poisonous, iii. 280.

Ostrich, manner in which the Arabians hunt them, ii. 8; and iii. 49; an Arabian horse of the first speed scarcely outruns them, ii. 8; its flesh proscribed in Scripture as unfit to be eaten; the greatest of birds; makes near approaches to the quadruped class; its description, iii. 45 to 50.

Otter of roses, a modern perfume, valued for its vegetable fragrance, ii. 150.

Otter, the link between land and amphibious animals, resembles terrestrial in make, and aquatic in living; its description, ii. 234.

Ovaria, two glandular bodies near the womb, resembling the cluster of small eggs found in fowls, i. 166.

Ouarine, species of the monkeys, so called by Mr. Buffon, remarkable for the loudness of their voice, and the use to which they apply it, ii. 264.

Oviparous animals distinguished from the viviparous, the two classes for generation; all other modes held imaginary and erroneous, i. 168.

Ouran-outang, the wild man of the wood, an animal nearly approaching the human race; is the foremost of the ape kind; this name given to various animals walking upright, but of different countries, proportions, and powers; its description in a comparative view with man; gigantic races of it described by travellers truly formidable: many are taller than man, active, strong, intrepid, cunning, lascivious, and cruel; its description; Battel calls him pongo; assures us that in all he resembles man, but is larger to a gigantic state; goes in companies, and this troop meeting one of the human species without succour, show him no mercy; they jointly attack the elephant, beat him with clubs, and force him to leave that part of the forest they claim as their own; is so strong that ten men are not a match for him; one of them dying, the rest cover the body with leaves and branches; a Negro boy taken by one of these, and carried into the woods, continued there a whole year without any injury; they often attempt the female Negroes going into the woods, and keep them against their wills for their company, feeding them plentifully all the time; a traveller assures, that he knew a woman of Loango that lived among them for three years; they built sheds, and use clubs for their defence; sometimes walk upright, and sometimes upon all fours, when fantastically disposed, ii. 250 to 256.

Ounce, or onza, remarkable for being easily tamed, and employed all over the East for the purposes of hunting, ii. 58; distinguished from the panther, the ounce of Linnæus, 121; does not pursue by the smell like those of the dog kind, 123.

Owl, description of the common horned owl; the skreech-owl, and its distinctive marks, iii. 59; common mark by which all birds of this kind are distinguished from others; general characteristics of birds of the owl kind; though dazzled by a bright daylight, they do not see best in darkest nights, as imagined; seeing in the night, or being dazzled by day, not alike in every species of this kind; description of the great horned owl; names of several owls without horns; these horns nothing more than two or three feathers that stand up on each side over the ear; father Kircher having set the voices of birds to music, has given all the tones of the owl-note, which make a most tremendous melody; sometimes bewildered; what they do in that distress; aversion of the small birds to the owl; how they injure and torment him in the daytime; a single owl more serviceable than six cats, in ridding a barn of mice; an army of mice devoured at Hallontide by a number of strange painted owls, 78 to 81.

Ox, its eyes are brown, ii. 193; on the fertile plains of India it grows to a size four times as large as the same kind bred on the Alps, 252.

Oxney, an island near Romney Marsh, in what manner produced, i. 112.

Oysters, a horse known to be fond of oysters, i. 282; surprising manner in which monkeys manage an oyster, ii. 264; bivalved shell-fish are self-impregnated; amazing size of oysters along the coast of Coromandel, iv. 39 to 41; the pearl oyster has a large whitish shell, the internal coat of which is the mother of pearl, 42.

P

Paca, improperly called American rabbit, an animal of South America; its cry, and manner of eating; is most like the agouti, yet differs in several particulars; its description; is seldom taken alive, defending itself to the last extremity; persecuted not only by man, but by every beast and bird of prey; breeds in such numbers, the diminution is not perceptible, ii. 197.

Pachomac deserts, where the formidable bird condor is chiefly seen, men seldom venture to travel, iii. 67.

Pacific sea, the winds never change in it, i. 137.

Pacos, a kind of camel in South America; its wool very valuable, iii. 11.

Paddock-moon, the silence of frogs in dry weather, may serve to explain an opinion that there is a month in the year so called, in which they never croak, iv. 53.

Pain, nothing but repeated experience shows how seldom pain can be suffered to the utmost, i. 238.

Paleness, often the effect of anger, i. 195.

Palm-tree, the elephant eats the shoots and branches to the stump, ii. 276.

Pambamarca, mountains at Quito in Peru; a very uncommon meteor seen upon it by Ulloa, i. 153.

Pangolin, vulgarly the scaly lizard, of all animals the best protected from external injury; its description; its flesh is considered by the Negroes of Africa as a great delicacy; it has no teeth; lives entirely upon insects; there is not a more harmless, unoffensive creature than this, unmolested, ii. 223 to 225.

Panther, the foremost of the mischievous spotted kind, by many naturalists mistaken for the tiger; the panther of Senegal; the large panther; difference between these two; that of America, or jaguar, compared with the two former ii. 302, 303 sometimes employed in hunting; the gazelle or leveret are its prey; it sometimes attacks its employer, 123.

Parr, a peasant, lived to a hundred and forty-four, without being abstemious, i. 235.

Paradise-bird, few have more deceived and puzzled the learned than this; it is an inhabitant of the Molucca Islands; erroneous reports concerning this bird, and what has given rise to them; two kinds of the bird of paradise; their distinction from other birds; the description of this bird; their king distinguished from the rest by the lustre of his plumage, and the respect and veneration paid to him; killing the king the best chance of getting the flock; the chief mark to know the king is by the ends of the feathers in the tail, having eyes like those of the peacock; how this bird breeds, or what the number of its young, remains for discovery; for beauty it exceeds all others of the pie-kind, iii. 121 to 123.

Paraquets. See *Parrot.*

Parana, a river in South America, wherewith at eight hundred leagues from its source, the Plata runs to its mouth, i. 90.

Parasina, name given by the Italians to a fishing-line, not less than twenty miles long; baited with ten or twelve thousand hooks, and sunk to the bottom along the coast in the Mediterranean, for that fishing called the peilago, iii. 268.

Parasite plants, not able to support themselves, grow and fix upon some neighbouring tree, i. 164.

Parrot, the middle or second size of the kind described; the ease with which this bird is taught to speak, and the number of words it is capable of repeating are surprising; a grave writer affirms, that one of these was taught to repeat a whole sonnet from Petrarch; the author has seen one taught to pronounce the ninth commandment articulately; account of a parrot belonging to Henry VII; always speak best when not accustomed to harsh, wild notes; in France very expert, but nothing to those of Brazil, which, Clusius says, are most sensible and cunning; natives of Brazil shoot them with heavy arrows, headed with cotton, which knock down the bird without killing it; more than a hundred different kinds counted on the coast of Africa; a hundred kinds known, not one of which naturally breeds in countries that acknowledge the Roman power; the green paraquet, with a red neck, was the first of the kind brought into Europe, and the only one known to the ancients from Alexander the Great to Nero, iii. 126 to 131.

Partridges, in England, a favourite delicacy at the tables of the rich, whose desire of keeping them to themselves, has been gratified with laws for their preservation, no way harmonizing with the general spirit of English legislation, and why; partridges of all sorts agree in one character, being immoderately addicted to venery, often to an unnatural degree; the male pursues the hen to her nest, and breaks her eggs rather than be disappointed; means the female uses to draw away any formidable animal that approaches her nest, iii. 163 to 165.

Passions, most of the furious sort characterized from the elevation and depression of the eye-brows, i. 192; freedom from passions not only adds to the happiness of the mind, but preserves the beauty of the face, 234.

Pastures, those of Great Britain excellently adapted to the cow kind, ii. 30.

Patas, by some called the red African monkey; its description, ii. 266.

Paul (St.) in Lower Britanny. See *Sand.*

Paunch, name of the first stomach of ruminating animals, ii. 27.

Pasan, name of the eighth variety of gazelles, by Mr. Buffon, ii. 53.

Peacock, a saying among the ancients, as beautiful as is the peacock among birds, so is the tiger among quadrupeds, ii. 113; that of Thibet the most beautiful of the feathered creation; the common people of Italy say it has the plumage of an angel, the voice of a devil, and the guts of a thief; in the days of Solomon we find his navies imported from the East apes and peacocks; Ælian relates they were brought into Greece from some barbarous country, and that a male and female were valued at thirty pounds of our money; it is said also, that when Alexander was in India, he saw them flying wild on the banks of the river Hyarotis, and was so struck with their beauty, that he laid a fine and punishment on all who should kill or disturb them; the Greeks were so much taken with the beauty of this bird, when first brought among them, that it was shown for money, and many came to Athens from Lacedæmon and Thessaly to see it; it strips the tops of houses of tiles or thatch, lays waste the labours of the gardener, roots up the choicest seeds, and nips favourite flowers in the bud; is still more salacious than the cock; requires five females at least to attend him, and the number not sufficient, will run upon and tread the sitting hen; the pea-hen, as much as possible hides her nest from him, that he may not disturb her sitting; this bird lives about twenty years, and not till the third year has that beautiful variegated plumage of its tail; in the kingdom of Cambaya, says Taverner, near the city of Be roch, whole flocks of them are in the fields; description of their habits; decoy made use of to catch them there, iii. 90 to 92.

Peacock, (*sea*,) a name given the Belearic crane, iii. 169.

Peak of Teneriffe, its volcano seldom free from eruptions, i. 45.

Peak, mountain in the Molucco islands, swallowed up by an earthquake, i. 69.

Pearl, an animal substance concreted and taking a tincture from the air; found in all bivalved shells, the inside of which resemble that substance called mother-of-pearl; *pearl oyster*, from which the mother-of-pearl is taken; wretched people destined to fish for pearls; usually die consumptive; in what manner they fish for them, iv. 41 to 43.

Pearls, in stags, are parts rising from the crust of the beam, ii. 68.

Peccary or *tajacu*, an animal, a native of America, at first view resembling a small hog; its description; an unceasing enemy to the lizard, the toad, and the serpent kinds; also feeds upon toads and serpents, ii. 93 to 95.

Pedigree, the Arabians preserve that of their best horses, ii. 8.

Pegu, a river called the Indian Nile, because of its overflowing, i. 91.

Pelagii, the Latin name for those shells fished up from the deep, iv. 28.

Pelican, a ruminating bird, ii. 28; a native of Africa and America; its description; the description of this bird from Father Labat; is not entirely incapable of instruction in a domestic state; instances of it, iii. 192 to 195.

Penguin, a heavy water-fowl; description of the Magellanic penguin; they unite in them the qualities of men, fowls, and fishes; instances of its gluttonous appetite; their food and flesh; are a bird of society, iii. 206 to 208.

Peninsula of India, on one side the coasts are near half the year harassed by violent hurricanes and northern tempests, i. 139.

Penpark-hole, in Gloucestershire; its description, from Captain Sturmy, i. 33.

Pepper, the Indians prefer that devoured and voided unconcocted by the toucan, iii. 117.

Perch, a prickly finned thoracic fish, its description, iii. 286.

Perfumes, no perfume has a stronger or more permanent smell than musk, ii. 59; the scent of the martin a most pleasant perfume, 163; some of the weasel kind have a smell approaching to perfume, 168; that of the musk or the civet, 169 to 172.

Persepolis, its pastures excellent for the purposes of rearing horses, ii. 12.

Persia, the horses of that country the most beautiful and most valuable of all in the East, ii. 12; there are studs of ten thousand white mares together, with the hoof so hard that shoeing is unnecessary, 10; description of the Persian horses by Pietro della Valle, 12.

Persian Gulf, a very dangerous wind prevails, by the natives called the Sameyel; it suddenly kills those it involves in its passage, and frequently assumes a visible form, darting in a bluish vapour along the surface of the country, i. 143.

Perspiration, an experiment from which the learned may infer upon what foundation the doctrine of Sanctorian perspiration is built, i. 201.

Peruvians understood the art of preserving their dead for a long time, i. 242.

Peter the Great, of Russia, celebrated a marriage of dwarfs; the preparations for this wedding were grand, yet in a style of barbarous ridicule, i. 254.

Petreoleum, an injection of this bituminous oil inwardly, and an application of asphaltum without, suffice to make a mummy, i. 267.

Pettichaps, a bird of the sparrow kind, iii. 142.

Phalanger, a kind of opossum; its description; called the rat of Surinam, ii. 272.

Pharaoh (*the cat of*,) name given to the ichneumon, ii. 166.

Pharaoh (*the capon of*,) thought to be the true ibis; a devourer of serpents, iii. 161.

Phasis, a river of Colchis, in Asia Minor, from the banks of which the pheasants were brought into Europe, and still retain their name, iii. 95.

Phatagin, an animal less than the pangolin; where to be found, ii. 225.

Pheasants, at first propagated among us, brought into Europe from the banks of the Phasis, a river of Colchis, in Asia Minor, where they still retain their name; description of this beautiful bird, iii. 95 to 98.

Phlegium, a high mountain of Ethiopia, swallowed by an earthquake, i. 69.

Pholas, the file-fish, places where these animals are found; their power of penetrating; the pillars of the temple of Serapis at Puteoli were penetrated by them; they pierce the hardest bodies with their tongue, iv. 45, 46.

Pichincha, a remarkable mountain, near Quito, in South America, i. 65.

Pie, no class of birds so ingenious, active, and well-fitted for society; they live in pairs, and their attachments are confined to each other; they are remarkable for instinct and capacity for instruction; instances of it; the few general characters in which they all agree, iii. 107, 108.

Pie (*sea*,) breeds in this country, and resides in its marshy parts, iii. 184.

Pigeons, are ruminating birds, ii. 28; those that live in a wild state by no means so fruitful as those in our pigeon-houses near home; the tame pigeons, and all its beautiful varieties, owe their origin to one species, the stock-dove; various names of tame pigeons; attempts made to render domestic the ring-dove, but hitherto fruitless; the turtle-dove a bird of passage; a pair put in a cage, and one dying, the other does not survive, iii. 131 to 135.

Pigmy, existence of a pigmy race of mankind founded in error or in fable, i. 253

Pigtail, is the last of the baboons; its description, ii. 259.

Pike, the description of this fish, iii. 288; instances of its rapacity, 299.

Pilchards, little differing from the herring; make the coast of Cornwall, their place of resort; advantages of this fishery; money paid for pilchards exported has annually amounted to near fifty thousand pounds, iii. 295.

Pillau, on the Baltic, the shores there divided into districts for the sturgeon-fishery. iii. 276.

Pills, of calcined shells and tobacco, used by the American Indians to palliate hunger, i. 209.

Pilori, one of the three distinctions of the musk rat; a native of the West Indies, ii. 208.

Pilot of the shark, name given the sucking-fish or remora, and why, iii. 263.

Pinch, name of a monkey of the sagoin kind; its description, ii. 268.

Pintada, or the Guinea hen, its description; different names given to this bird, iii. 98.

Pintail, a kind of duck, iii. 221.

Pipal, the Surinam toad, an extraordinary and hideous creature; its description, iv. 60, 61.

Pipe-fish, cartilaginous, and not thicker than a swan's quill; its description, iii. 279.

Piper-worms, and other little animals, fix their habitations to the oyster's sides, and live in security, iv. 39.

Pit-falls, a wolf, a friar, and a woman taken in one all in the same night, ii. 145.

Pithekos, a name given by the ancients to the ape properly so called, ii. 256.

Pivot, the razor-shell, its motion, and habits; is allured by salt, iv. 41.

Placenta, that body by which the animal is supplied with nourishment, i. 175.

Plague, not well known whence it has its beginning; is propagated by infection; plague spread over the world in 1346, after two years travelling from the great kingdom of Cathay, north of China, to Europe; the plague desolated the city of London in 1665, i. 132, 133.

Plaisne en Anjou, a village in France, particular account of a dwarf born there, i. 255.

Plaster of Paris, finely powdered, boils and heaves in great waves, like water, i. 76.

Planets exceed the earth one thousand times in magnitude; at first supposed to wander in the heavens without fixed paths; perform their circuits with great exactness, and strict regularity, i. 10.

Plants and vegetables, will not grow so fast in distilled as undistilled water. i. 72; compared with animals; similitude; how assimilated in different climates and soils, 162, 163; the sensitive, that moves at the touch, has as much perception as the fresh-water polypus, possessed of a still slower share of motion, 162. See *Caraguata*, i. 162 See *Parasite*, 134.

Plate, or *Plata*, a great river in South America; its source and length, i. 90.

Platina, or white gold, the most obstinate of all substances, i. 36.

Plemonecles, the flumide, description of this fish, iii. 287, 288.

Pleurs en Champagne, a town in France, burried beneath a rocky mountain, i. 67

Pliny, in his arrangements, placed the bats among birds, ii. 229.

Plover, the green and grey, are birds of passage; the Norfolk plover, iii. 184.

Plumage, of the king-fisher preserves its lustre longer than any other, iii. 227

Pochard, a kind of duck, iii. 221.

Poetry, our ancestors excel us in the poetic arts, i. 260.

Pointer, a kind of dog, ii. 132.

Poison, the most deadly poisons are often of great use in medicines, i. 165; the serpent-poison may be taken inwardly, without any sensible effects, or any prejudice to the constitution; if milk be injected into a vein, it will kill with more certain destruction than even the poison of the viper, iv. 93. See *Fire flare*. See *New Providence*.

Polar regions, description of them, i. 19; and of the inhabitants round them, 240.

Pole-cat, a distinct species from the ermine; resembles the ferret so much, that some have thought them the same animal; female brings forth, in summer, five or six young at a time, and supplies the want of milk with the blood of such animals as she can seize; the species confined in Europe to a range from Poland to Italy, ii 160 to

163; pole-cat of America and Virginia are names for the squash and the skink; distinctions of these animals, 167; seizes the flying squirrel, 191.

Poles, trade winds continually blow from them towards the equator, i. 136; the winter beginning round the poles, the same misty appearance produced in the southern climates by heat is there produced by cold; the sea smokes like an oven there, 154; the strength of the natives round the polar regions is not less amazing than their patience in hunger, 241.

Polynemus, description of this fish, iii. 286.

Polypus, very voracious; its description; uses its arms as a fisherman his net; is not of the vegetable tribe, but a real animal; every polypus has a colony sprouting from its body; and these new ones, even while attached to the parent, become parents themselves, with a smaller colony also budding from them; though cut into thousands of parts, each still retains its vivacious quality, and shortly becomes a distinct and complete polypus, fit to reproduce upon cutting in pieces; it hunts for its food, and possesses a power of choosing it or retreating from danger, i. 169, 170.

Polypus-coral, the work of an infinite number of reptiles of that kind, iv. 220.

Pomerania, a large part of it covered by the sea, i. 113.

Pongo, name given by Battel to the ouran-outang, ii. 254.

Poppies, affect with drowsiness those who walk through fields of them, i. 131.

Porcelain, an artificial composition of earth and water, united by heat, i. 71.

Porcupine, as to quills, might be classed among the birds, i. 277; its description, ii. 219; of all those brought into Europe, not one ever seen to launch its quills, though sufficiently provoked; their manner of defence; directs its quills pointing to the enemy; and Kolben relates, the lion then will not venture an attack; feeds on serpents and other reptiles; porcupine of Canada subsists on vegetables, 220, 221.

Porcupine of the sea, described, iii. 280.

Pork. unpalatable with us in summer, is the finest eating in warmer latitudes, ii. 18.

Porpoise, or *Porpesse*, a fish less than a grampus, with the snout of a hog; its description and habits, iii. 255.

Ports choaked up with sand by the vehemence of the wind, i. 140.

Pouch or bag, receptacle of the civet, ii. 171. See *Bustard*, iii. 99. See *Pelican*, iii. 193.

Poultry, general characteristics of the poultry kind; nearly all domestic birds of this kind maintained in our yards, are of foreign extraction; the female takes all the labour of hatching and bringing up her young, choosing a place remote from the cock, iii. 84, 85.

Powis Land, in Wales, for many ages famous for a swift and generous race of horses, ii. 16.

Powters, a variety of the tame pigeons, iii. 134.

Pregnancy of some women found to continue a month beyond the usual time, i. 178; of all animals, in point of time, is proportioned to their size, 286; in that state no animals except the hare, receive the male, ii. 178; the duration in the female of the elephant still unknown, 280.

Pressures, perpendicular in rivers, always in exact proportion to the depth, i. 84.

Prey, all the males of these birds less and weaker than the females, iii. 58. See *Birds*.

Pricket, name hunters give the buck the second year, ii. 73.

Propagation of gnats, one of the strangest discoveries in natural history, iv. 207; a new kind lately discovered in a most numerous tribe of animals, propagated by cuttings, 210; different manner of that operation in the polypi, 219.

Propolis, a resinous gum, with which bees plaster the inside of their hives, iv. 177.

Proportion of the human figure, little known with precision in regard to it, i. 200.

Provider, of the lion, what has given way to the jackal's being so called, i. 281.

Psalmodi, an island in France, in A. D. 815, now six miles from the shore, i. 113.

Ptarmagan, sort of grouse, chiefly found in heathy mountains, and piny forests, iii. 100.

Pthiriasis, the lousy disease, frequent among the ancients; principal people who died of this disorder, iv. 119 to 121.

Puffin, or *Coulterneb*, marks that distinguish this bird; its residence; migration; found by hundreds, cast away upon shores, lean and perished with famine, iii. 210 to 212.

Puget adapted the cornea of a flea in such a position, as to see objects through it by the means of a miscroscope; strangeness of the representations, iv. 165.

Puma, an animal decorated with the name of American lion, though when compared, so contemptible as to be inferior to that called the American tiger ii 112.

Pump, an experiment upon a carp put under a receiver, iii. 236.

Purre, a small bird of the crane kind, with a shorter bill, and thighs bare of feathers iii. 182.

Puteoli, a city swallowed up by an earthquake, had a temple of Serapis, the pillars of which, while under water, were penetrated by the pholas, or file-fish, iv. 46.

Putrefaction a new cause of animal life, i. 169.

Pyramids of Egypt, one of them entirely built of a kind of free-stone, in which petrified shells are found in great abundance, i. 26.

Pyrard, his account of a kind of apes called baris, which properly instructed when young, serve as useful domestics, ii. 253.

Pyrites, their composition, i. 37.

Q.

Quadrupeds, they bear the nearest resemblance to man, i. 276; the weaker races exert all efforts to avoid their invaders; next to human influence, the climate seems to have the strongest effects upon their nature and form; both at the line and the pole, the wild are fierce and untameable; the large and formidable produce but one young at a time, while the mean and contemptible are prolific, 281 to 285; the largest are found in the torrid zone, and these are all fond of the water, ii. 37; the chevrotin, or little Guinea-deer, the least of all cloven-footed animals, and perhaps the most beautiful; its description, 56; general description of amphibious quadrupeds, 234.

Quail, a bird of passage; description of it, iii. 105.

Quarry of Maestricht, 40,000 people may take shelter in it; its description, i. 32.

Quicksilver, remarkable effects of it at the mines near Idra, i. 38.

Quills. See *Porcupine*, ii. 220.

Quito, in South America, one of the most charming regions upon earth, i. 65.

R.

Rabbit, a ruminating animal, ii. 28; rabbit and hare distinct kinds; a creature covered with feathers and hair, said to be bred between a rabbit and a hen; breed seven times a-year, and bring eight young each time, 184; various colours of rabbits; account of their production; the rabbit generally fatter, and lives longer than the hare, 185, 186.

Rabbit, (*Syrian*,) remarkable for the length, gloss, and softness of the hair, ii. 186.

Rabbit, (*Brazilian*,) shaped like the English, but without a tail, ii. 198.

Racoon, with some the Jamaica rat; its description and habits; capable of being instructed in amusing tricks; its food, iii. 16, 17.

Rainbows, circular rainbows in the Alps, i. 63; and between the tropics, and near the poles, 152; one of the three rainbows seen by Ulloa, at Quito, was real, the rest only reflections thereof; a glass globe, filled with water, will assume successively all the colours of the rainbow, 154.

Rain-fowl, the name given in some parts of the country to the woodpecker, iii. 118.

Rams, it is no uncommon thing in the counties of Lincoln and Warwick, to give 100 guineas for a ram, ii. 42.

Ranguer, name of the ninth variety of gazelles, made by Mr. Buffon, ii. 55.

Rarefaction of the air produced by the heat of the sun in countries under the line, i. 138.

Rats, *musk-rat*, three distinctions of that species; the *ondatra*, *desman*, and *pilori*; in what they resemble each other; *great rat*, called also *rat of Norway*, though unknown in all northern countries; originally from the Levant, and a new comer into this country; first arrival upon the coasts of Ireland, with ships trading in provisions to Gibraltar; a single pair enough for the numerous progeny now infesting the British Empire; the feeble animals do not escape the rapacity of the Norway rat, except the mouse; they eat and destroy each other; produce from fifteen to thirty at a time, and bring forth three times a-year; *black water-rat* not web-footed, as supposed by Ray; the *German rat*, see *Cricetus*, ii. 202 to 208.

Rat of Surinam. See *Phalanger*, ii. 272.

Rat of Jamaica, a name by some given the *racoon*, iii. 17.

Rattle-snake, kind of friendship between it and the armadillo, or tatou, frequently found in the same hole, ii. 228; its description and dimensions; effects of its bite; the remedies against it; power of charming its prey into its mouth; facts related to this purpose, iv. 97 to 99.

Ravens, how distinguished from the *carrion crow* and *rook*; manners and appetites; white ravens often shown, and rendered so by art; amusing qualities, vices and defects; the Romans thought it ominous, and from fear paid it profound veneration, Pliny's account of one kept in the temple of Castor, that flew down into the shop of a tailor, 109 to 111; the horned Indian raven, 113.

Ravenna, once stood by the sea-side, and is now removed from it, i. 112.

Ray, his method of classing animals, i. 270.

Ray, figure of the fish of this kind, and their differences; amazing dimensions of one speared by Negroes at Guadaloupe; to credit the Norway bishop, there are some above a mile over; supposed to be the largest inhabitants of the deep, iii. 264 to 266.

Rays of light moderated, and their violence dissipated by the air, i. 134.

Rays of the sun, darted directly upon the surface of the water, compared to so many bars of red-hot iron, i. 148.

Rasor-shell, the *pivot;* its motion and habits; is allured by salt, iv. 41.

Reaumur, his chymical elaboratory for hatching chickens, iii. 90.

Red-breast. See *Robin Red-breast.*

Red-start, bird of the sparrow kind, iii. 142.

Red-wing, or *fieldfare*, bird of passage; its nest and eggs, iii. 145.

Reed, stuck into the ground in Persia continues to burn like a flambeau, i. 41.

Reeve, name given to the female of the *ruff*, iii. 186.

Reflection of sound, its laws not as well understood as those of light, i. 224.

Regions, the highest region in the world, i. 65.

Rein-deer. See *Deer*, ii. 81.

Remora, the *sucking-fish*, it sticks to the shark, and drains away its moisture, iii. 263.

Reproduction. See *Trembley*, iv. 213.

Reptiles grow to a prodigious size in the internal parts of South America and Africa, and why; infinite numbers of them not seen in this part of the world, and why, i. 163, 164.

Resemblance, to the common parent of all; the olive-coloured Asiatic, and the jet black Negro, claim the honour of hereditary resemblance to him; argument sufficient to prove the contrary, i. 249; difficult to give a reason why the child should resemble the father or the mother, 253.

Respiration in fishes, general method of explaining it, iii. 235.

Rhine, a great river, proceeds from the Alps, i. 62; part of it lost in the sands, not far from Leyden; the greatest part arrives at the ocean, 93.

Rhinoceros, a ruminating animal, ii. 28; not afraid singly to oppose the lion, 110; next to the elephant the most powerful of animals; general outline of it; the elephant defeated by it; method of taking them; some found in Africa with a double horn, one above the other, 285 to 289.

Rivers, all our greatest find their source among mountains, i. 62; their production, according to De la Hire, 81; other hypotheses upon the same subject, 82; every great river, whose source lies within the tropics, has its stated inundations, 90; those of countries least inhabited are very rocky and broken into cataracts, and why, 91; at the poles necessarily small, and why; the rivers of Europe more navigable and more manageable than those of Africa and of the torrid zone, 93, 94.

Robin-red-breast, a slender-billed bird of the sparrow kind, living upon insects, iii. 142.

Rock, great bird, described by Arabian writers, and exaggerated by fable, iii. 66.

Rocks. See *St. Kilda*, iii. 202.

Roebuck. See *Deer*, ii. 74.

Roger De Belegme, the first who attempted to mend our breed of horses, ii. 15.

Roger of Sicily. See *Silk Manufactures*, iv. 170.

Roller, a beautiful bird of the pie kind; its description, iii. 116.

Romans cut down all the woods and forests in Britain, and why, i. 116; the vanity of their boasts best shown by the parrot kind; in a hundred species now known, not one of those birds naturally breeds in any of the countries that acknowledged the Roman power, iii. 131; a Roman emperor had fifteen hundred flamingoes' tongues served up in a single dish at a feast, 179; a Roman senator used to throw into his ponds such of his slaves as offended him, to feed the lampreys, 274.

Rombald, a holy, temperate man, said to have lived 120 years, i. 209.

Rooks, of the pie kind; not carnivorous; their plan of policy; their chief food, iii 111 to 113.

Rousette, the great bat of Madagascar. See *Bat*, ii. 231.

Royston-crow, a bird of passage described, iii. 111.

Rubeth, the land toad. See *Toad*, iv. 59.

Ruff, small bird of the crane kind; manner of taking it, iii. 186.

Ruminant quadrupeds, birds, fishes, insects; men known to ruminate; instance in a young man at Bristol; those of the cow kind hold the first rank, ii. 28, 29; all of this class internally much alike; have not the upper foreteeth, 43; the stag performs this with more difficulty than the cow or sheep, 65. See *Animal*, ii. 27 to 29.

Runner, the corrira, bird of the crane kind, its description, iii. 181.

Runts, a variety of tame pigeons produced by cross coupling, iii. 134.

Rust, copper and iron quickly covered with it; gold contracts no rust, i. 126.

Rut, time when the stag feels the desire of copulating, ii. 64.

S.

Sable, its description from Mr. Jonelin, the first accurate observer of this animal; sables leap with ease from tree to tree, and are afraid of the sun; different colours of their fur; hunting the sable chiefly the lot of soldiers and condemned criminals; how directed to shoot them, ii. 165, 166.

Sabre, the trachepterus, description of this spinous fish, iii. 286.

Sacre, bird of the generous breed of hawks, iii. 72.

Sago tree, ate by the elephant to the stump, ii. 276.

Sai, the bewailer, a monkey of the new continent, ii. 268.

Sail, a stag hard hunted, taking to the water, is said to go sail, ii. 68.

Saines, name of the nets used in the pilchard fishery, on the coast of Cornwall, iii. 295.

Sajou, third sort of the sapajou, a monkey of the new continent, ii. 267.

Saki, the cagui, the largest monkey of the sagoin kind; its description, ii. 268.

Sal ammoniac made of the urine of camels, iii. 8.

Salamander, there is no such animal existing as that described by the ancients; the modern salamander a lizard; its conformation and habits; reports concerning their venom; idle notion of its being inconsumable in fire, iv. 71 to 73.

Saliva, in the lama, or American camel, supplied by Nature in such abundance, that it spits on all occasions, and seems the only offensive weapon of this harmless creature, iii. 10.

Salmon, a ruminating fish, ii. 28; a soft finned abdominal fish, iii. 288.

Salt-water. See *Sea* and *Sea-water*.

Salt, Bay salt, brought from the Bay of Biscay, a strong kind made by evaporation in the sun, i. 99; volatile caustic salt obtained in great quantities from the cantharides fly, iv. 202.

Samiri, the aurora, the smallest and most beautiful monkey of the sapajou kind, iii. 272.

Samoid Tartars, description of that people, i. 240.

Sanctorian statical experiments upon a weak foundation, i. 201.

Sand, rolling in waves like a troubled sea, and overwhelming all with inevitable destruction, i. 13; tract of a country, lying along the sea-side in Lower Britanny, inhabited before the year 1666, now lies desert, being covered with sand to the height of twenty feet, 146.

Sanderling, small bird of the crane kind, iii. 182.

Sandpiper, small bird of the crane kind, iii. 182.

Santorin, an earthquake there in 1707; a volcano near it, i. 56.

Sapajou, name given to the monkeys of the new continent, ii. 267.

Savages more difficult in point of dress than the fashionable or tawdry European; instance of it, i. 196; perform a journey of twelve hundred leagues in less than six weeks, 203; oblige their women to a life of continual labour; is surprised an European walks forward for his amusement and returns back again, 205.

Sauce, made with the blood and marrow of the rein-deer by the Laplanders, ii. 87

Scallop, in its shell, moves forward upon land, and swims upon the surface of the water, by contrivance in a singular manner, iv. 40.

Scar, a child distinctly marked similar to one the father received in battle, i. 249.

Scarus, if we believe Ovid, is like the salmon, a ruminating fish, ii. 28.

Scoup duck, a variety of the duck-kind, iii. 221.

Scent, the Negroes of Guinea have an insupportable scent, i. 145.

Schotteus assures us, he saw an instance of fishes being allured by music, i. 223.

Sciæna, a spinous fish; description of this fish, iii. 285.

Scolopendra, the centipes, a hideous, angry worm, described, iv. 129.

Scomber, the mackarel, a prickly-finned thoracic fish; its description, iii. 285.

Scorpæna, or father-lasher, of the prickly-finned thoracic kind, iii. 286.

Scorpion, four principal parts distinguishable in this animal; the reservoir where its poison is kept; effect of its sting upon a dog, in an experiment made by M. Maupertuis; experiments made upon other dogs; instances of its irascible nature and malignity; when driven to extremity, destroys itself; instance of it; captivity makes it destroy its young; a scorpion of America produced from the egg, iv. 124 to 129.

Scorpion (*Water*,) an insect with wings, described, 190.

Scoter, an European duck, iii. 221.

Scotland has land in it at one time covered with water, at another free, i. 114.

Scotchman, in the Tower, took not the least sustenance during six weeks, i 209.

Sea was open to all till the time of the emperor Justinian, i. 96; sensibly retired in many parts of the coasts of France, England, Holland, Germany, and Prussia, 112; Norwegian sea has formed several little islands from the main land, and still daily advances upon the continent, 114; its colour not from any thing floating in it, but from the different reflections of the rays of light; a proof of it; the sea grows colder in proportion as divers descend, 118; smokes like an oven near the poles, when the winter begins, 154; no fish imbibe any of the sea-saltness with food or in respiration, iii. 291.

Sea (*Red*,) choaked up with coraline substances, i. 117.

Sea-eggs, name given to the multivalve shell-fish, of the echini, which move, iv. 41.

Sea-nettles, name given by some to the star-fish. iv. 214.

Sea-water, various methods proposed to render it fresh for the use of seamen in long voyages, 95; about a forty-fifth part heavier than fresh-water; is heavier, and consequently salter, the nearer we approach the line, 97.

Sea-worm may be multiplied by being cut to pieces, i. 168. See *Polypus*.

Seal, its description; the water its habitation; seldom at a distance from the shore; direct their course to northern coasts, and seas free of ice, in two departures, observing time and track; how and by what passages they return unknown; females in our climate bring forth in winter; where they rear their young; hunt and herd together, and have a variety of tones like dogs and cats, to pursue prey, or warn of danger; how the Europeans and Greenlanders destroy them; in our climate they are wary, and suffer no approach; never sleep without moving, and seldom more than a minute; sea-lion, in Anson's Voyages, the largest of the seal family, ii. 241 to 246.

Seeds, some thought to thrive better for maceration in the stomach of birds, before they be voided on the ground, iii. 142.

Senegal, a river in Africa; its course; is navigable for more than three hundred leagues, i. 88; receives more than twenty rivers, 91; the natives consider forty years as a very advanced time of life, and generally die of old age at fifty, 136.

Sensations, their illusions at first when man is newly brought into existence, described by Mr. Buffon, i. 230; fish fall behind terrestrial animals in their sensations, iii. 231

Senses, of all senses man is most inferior to other animals in that of smelling; and it seems not to offend them, i. 227; the grossest, and most useful of all, is that of feeling, 229.

Sensitive plant has as much perception as the fresh water polypus, i. 162.

Seps, improper name of the Chalcidian lizard; its description, iv. 187.

Seraglio, to be able to furnish one the only ambition of an Asiatic, i. 78.

Serpents, the sea about the islands of Azores replenished with them for want of motion, i. 99; the various hissings at the close of the evening, make a louder symphony in Africa, than birds in European groves in a morning, 281; to believe all said of the sea-serpent is credulity, to refuse assent to its existence is presumption, iii. 244; sea-serpent, the elops described, 286; little serpents live for several years in glasses, never eat at all, or stain the glasses with excrements; little serpent at the Cape of Good Hope, and north of the river Senegal; long serpent of Congo; boasted pretensions of charming serpents; Egyptians paid adoration to a serpent, and the inhabitants of the western coast of Africa retain the same veneration; their principal food birds, moles, toads, lizards, iv. 91 to 102; the prince of serpents, a native of Japan, the greatest favourite of savages, 102.

Serval, a native of Malabar, resembling the panther in its spots, ii. 122.

Setter, a dog of the generous kind, ii. 125.

Severn, lamprey of this river, the most delicate of all fish, iii. 272.

Shagreen, made of the skin of the wild ass, ii. 18; also of the shark, iii. 264.

Shamois, a kind of goat, in the mountains of Dauphiny, Piedmont, Savoy, Switzerland, and Germany; its description; not found in summer except in caverns of rocks, amidst fragments of ice, or under shades of spreading trees; during winter, it sleeps in the thicker forests, and feeds upon shrubs and buds of pine-trees, and scratches up the snow for herbage, ii. 49 to 52. See *Bezoar*, ii. 52.

Shank, the *red* and *green shank*, varieties of the crane kind, iii. 182.

Shark, description of the great white shark; no fish swims so fast; outstrips the swiftest ships; instances of frightful rapacity in this fish; its enmity to man; brings forth living young; Rondeletius says, the female of the blue shark lets her brood, when in danger, swim down her throat, and shelter in her belly, iii. 260 to 263.

Sheat-fish, the silurus of the prickly-finned abdominal kind, iii. 286.

Sheep, the author saw one that would eat flesh, i. 282; no country produces such sheep as England, larger fleeces, or better for clothing; the sheep in its noblest state is in the African desert, or the extensive plains of Siberia; those called strepsicheros, a native of the Archipelago; Guinea sheep described; bring forth one or two at a time, sometimes three or four; bear their young five months, 38 to 41; the intestines thirty times the length of their body, 104; in Syria and Persia, remarkable for fine gloss, length, and softness of hair, 105. See *Moufflon*.

Sheldrake, a variety of the pond-duck; supposed a native of England, iii. 221.

Shells, (*fossil*,) found in all places near to and distant from the sea, upon the surface of the earth, on the tops of mountains, or at different depths digging for marble, chalk, or other terrestrial matters, so compact as to preserve these shells from decay, i. 15; various kinds found at a hundred miles from the sea, at Touraine in France; a continued bed of oyster-shells found through the whole circumference of five or six acres of ground near Reading, in Berkshire; shells found petrified in all the Alpine rocks, in the Pyrenees, on the hills of France, England, and Flanders; a floor or pavement of petrified shells found in Kent, near the Medway; shells always remaining in the deep; easier to believe fossil shells bred in fresh-water, than that the sea for a time covered the tops of high mountains, i. 23 to 27; sea-shells exceed land or fossil-shells in beauty; some living land shells not inferior in beauty to fresh-water shells; great variety of fossil, or extraneous shells; different states of preservation; every shell the spoil of some animal; no matter how parted from the sea, iv. 22 to 28.

Shells of the sea, of all sea-shells, that of the nautilus the thinnest and most easily pierced, iv. 35; all bivalved shells furnish pearls, and their insides resemble and afford that substance called mother-of-pearl, 41.

Shells, (*animal*,) of the armadillo or tatou, one of the most striking curiosities in natural history, ii. 225; turtle-shells of an amazing magnitude, iv. 20.

Shetland Isles, amazing quantities of herrings appearing off these islands, iii. 293.

Shores. See *St. Kilda*.

Short-heads, name given by sailors to the young of the whale, iii. 247.

Shoveller, species of the crane kind; inhabitants of the Cape of Good Hope respect it as the ancient Egyptians did their ibis; its nest and eggs, iii. 176.

Shoulders, high in sickly persons; people dying are seen with their shoulders drawn up; shoulders in women narrower than in men, i. 199, 200.

Showers, shower of hail in 1510; its description, i. 150; of stones, fishes, and ivy-berries, raised into the air by tempests, in one country, and falling at a distance like rain to astonish another, 156.

Siagush. See *Lynx*.

Siberia, the isatis found in this country, and seldom in milder climates, ii. 153; the sable resembling the martin found in it, 166; enormous tusks found lodged in the sandy banks of its rivers, 285.

Sighs, in what manner produced; when invigorated produce sobbing, i. 194.

Sight, of old men indistinct for bodies close to them, but more precise for objects at a distance from them, and why, i. 219; of birds exceeds that of other animals, and excels in strength and precision; a kite, from an imperceptible height in the clouds, sees its prey, and darts on it with unerring aim, iii. 30; of birds that prey by day, astonishingly quick, and in such as ravage by night, so fitted as to discern objects in darkness with precision, 58.

Signs of death, uncertainty of them ought to make every one cautious of giving up a friend as dead, and exposing him to real death, or a premature interment, i. 239.

Silks, brought to Jamaica, and there exposed to the air, rot while they preserve their colour, but kept from air, retain their strength and gloss, i. 127.

Silk Manufactures, established in Europe, in the beginning of the twelfth century, by Roger of Sicily, iv. 170.

Silkworm, the most serviceable of all such creatures, iv. 153; two methods of breeding them; Pausanias's description of this worm; preparations made before spinning the web; the cone or ball of silk described; efforts to burst the cone; free from confinement, it neither flies nor eats; few of these animals suffered to come to a state of maturity, and why, 170 to 173.

Silurus, the sheat-fish of the prickly finned abdominal kind, iii. 286.

Simeon, said to have lived a hundred and twelve years, i. 209.

Sinews of the rein-deer, the strongest kind of sewing-thread, ii. 87

Single, name of the tail of the stag, ii. 67.

Siskin, singing-bird of the sparrow kind, with a thick and short bill, iii. 142.

Skeleton of the bat, in some measure, resembles that of man, ii. 229; some human lately discovered of an enormous size, on the banks of the Ohio, in America, 285.

Skin, the only part of the body that age does not harden; whence its wrinkles proceed, i. 234; of the rein-deer, ii. 87; of the tiger, 75; of the black fox, 150; most valuable part of the martin's skin; of all, that of the sable most coveted, and held in highest price, the fur surpassing all, 165; of the civet, 170; of the ondatra also very valuable, 210; of the mole, 214; of the hedge-hog, 217; of the elephant, 274; of the rhinoceros, 285; of the ostrich, iii. 50; of the great Greenland whale, 244

Skink, an animal called one of the pole-cats of America, ii. 168.

Skull-fish, name of the whale above two years old, iii. 247.

Slatberg, in Ireland, (in the lands of) there stood a declivity, and the earth of it was found sliding down the hill upon the subjacent plain, i. 68.

Sleep, with some of the lower animals, takes up the greatest part of their lives; man the only creature requiring sleep from double motives, for the refreshment of the mental and of the bodily frame; want of it produces madness; procured to man with more difficulty than to other animals; in what manner sleep fetters us for hours together, according to Rohault; bodily labour demands a less quantity of it than mental; the famous Philip Barretier slept twelve hours in the twenty-four; numberless instances of persons, who, asleep, performed many ordinary duties of their calling; and, with ridiculous industry, completed by night, what they failed doing by day, remarkable instance related in the German Ephemerides. See *Arlotte*, i. 210 to 213.

Sloth, two different kinds of that animal, the ai and the unan; both seem the meanest and most ill-formed of all animals that chew the cud; formed by nature to climb; they get up a tree with pain, but utterly unable to descend, drop from the branches to the ground; strip a tree of its verdure in less than a fortnight, afterwards devour the bark, and in a short time kill what might prove their support; every step taken, sends forth a plaintive, melancholy cry; like birds, have but one vent for propagation, excrement, and urine; their look piteous, to move compassion, accompanied with tears that dissuade injuring so wretched a being; one fastened by its feet to a pole, suspended across two beams, remained forty days without meat, drink, or sleep; an amazing instance of strength in the feet instanced, iii. 21, 22.

Slot, term for the print of the hoof of the stag, ii. 67.

Slow, name given by some to the blind worm, iv. 101.

Smell, the musky not properly a characteristic mark of any kind of animal, ii. 38; none more permanent than musk, 59; strong offensive smell of foxes often the cause of their death, 148; of the genet, not endured by mice and rats, 170.

Smelling, Bramins of India have a power of smelling, equal to what is in other creatures; can smell the water they drink, to us quite inodorous; negroes of the Antilles by smell distinguish the footsteps of a Frenchman from those of a negro, i. 227, 228.

Smile, Fielding asserts, a person with a steady glavering smile, never failed to prove himself a rogue, i. 195.

Snail, (*garden*,) is surprisingly fitted for the life it is to live; organs of life, it possesses in common with animals; and what peculiar to itself; every snail at once male and female; and while it impregnates another, is impregnated in turn; coupling of these animals; possessed of the power of mending the shell; and come to full growth they cannot make a new one; *sea snail*, *fresh water snail*, and *land snail*; common garden snail compared with the fresh water snail and sea snail; sea snails found viviparous, others lay eggs; manner in which the sea snails impregnate each other; food of all sea snails lies at the bottom; of sea snails, that most frequently swimming upon the surface, whose shell is thinnest, and most easily pierced, is the nautilus; its description; peculiarity by which the nautilus is most distinguished, iv. 30 to 36.

Snail, (*sea*,) a cartilaginous fish, described, iii. 279.

Snake. See *Serpents*.

Snake, (*black*,) its description and food; are oviparous, iv. 101.

Snipe, a water-bird of passage; its description, iii. 182, 183.

Snow, inhabitants of places where fields are continually white with snow, generally become blind before the usual course of nature, i. 14.

Snow-slips, a family in Germany lived for a fortnight beneath one, i. 69.

Sobbing is a sigh still more invigorated, i. 194.

Soland goose, iii. 200. See *Bass* and *Gannet*.

Soldier-crab, iv. 13. See *Crab*.

Solfatara, a valley near Naples; exhibits the appearance of an earthquake, i. 54.

Sonorous bodies. See *Vibrations*.

Soot, as well as salt, will destroy snails, iv. 31.

Sore, name the hunters give the buck the fourth year, ii. 73.

Sorel, the hunter's name for the buck the third year, ii. 73.

Sound conveyed by air is lost in vacuo, i. 135; sounding bodies of two kinds, unelastic returning a single sound, and elastic rendering a succession of sounds; laws of the reflection of sound not so well understood as those of light; persons of a bad ear oft deceived as to the side whence sound comes; trumpets made to increase sounds, 224, 225.

Source, rivers have their source in mountains, or elevated lakes, i. 84.

Southminster marshes over-run with an army of mice, iii. 82.

Spalanzani, his experiments concerning reproductions in animals, iv. 213.

Spaniards, the only people of Europe acquainted with the value of the ass, ii. 21.

Spaniels, land and water, the offspring of the beagle, transported into Spain or Barbary, so altered, and converted there; a dog of the generous kind; the land-spaniel; the water-spaniel, ii. 132, 128.

Spanish flies. See *Cantharides.*

Sparrows, house-sparrows; various birds of the sparrow kind; their food; songsters of this class; their migrations, iii. 141 to 143.

Sparrow-hawk, one of the baser race of hawks, iii. 72.

Sparus, the sea-bream, its description, iii. 285.

Spawn, different seasons for fish to deposit their spawn, iii. 229.

Spawning, peculiar preparation of the lamprey for spawning, iii. 272.

Spears, (*burning*,) a peculiar kind of aurora borealis, i. 156.

Spears, the horns of the stag the third year, ii. 67.

Spermaceti, the whole oil of the cachalot easily converted into that concrete; efficacy of spermaceti in medicine very small, iii. 254.

Spermaceti whale, the cachalot described, iii. 253.

Spiders, in South America and Africa, as large as sparrows, i. 163; the spider for several months together subsists upon a single meal, 206; chief of our native spiders not venomous; Martinico spider's body as large as a hen's egg; manner of making their webs; Lister has distinguished the sexes of this animal; experiment made by Mr. Reaumur to turn their labours to the advantage of man; gloves made from their webs; found it impracticable to rear them, iv. 110 to 115.

Spiders, (*water*,) inhabit the bottom, yet never wet, but inclosed in a bubble of air surrounding them on all sides, iv. 115.

Spinal marrow and the brain, the parts first seen begun in the embryo, i. 214.

Spinous class of fishes already extended to four hundred sorts, iii. 282; Gouan's system and arrangement of the various sorts of spinous fishes, 284; their general leading marks and difference from others, 289.

Spirits of wine flame with a candle not with a spark, i. 39.

Spitsbergen, bodies never corrupt there, though buried for 30 years, i. 194.

Sponges, opinion of Count Marsigli and others about them, iv. 221.

Spoonbill, descriptions of the European and American spoonbill, iii. 175.

Sports, one peculiar to the Italians, in which horses without riders run against each other, ii. 10; remarkable on horseback, among the grandees of Guinea, 13; of wild asses exhibited in Persia, 18; of the bird-catchers counterfeiting the cry of the owl, iii. 82; of hunting the turkey in Canada, 93. See *Cock*, iii. 87.

Spouts of water at Sea common in the tropical seas, and sometimes in our own; description of one in the Mediterranean by Tournefort; solutions offered for this phænomenon, i. 156, 157.

Spout-holes in the cetaceous tribe, described, iii. 241.

Springs of water, experience alone can determine the useful or noxious qualities of every spring, i. 73; one mentioned by Derham, which he never perceived to diminish in the greatest drought, 83.

Squash. See *Polecat.* See *Stinkard*, ii. 168.

Squinting, instances of squinting communicated by a father to his offspring, i. 249.

Squirrel, a ruminating animal, ii. 28; classed as such by Pyerius, 177; some live on the tops of trees, others feed on vegetables below, where also they take shelter in storms; description of its qualities, food, and mansion, 187 to 189.

Stag, first in rank among quadrupeds; its elegant form described; a stag and tiger inclosed in the same area, the stag's defence so bold, the tiger was obliged to fly; the stag in rut ventures out to sea from one island to another, and swims best when fattest, ii. 60 to 65; the hind, or female, uses all her arts to conceal her young from him, the most dangerous of her pursuers; stag royal in Mexico; of Canada, brought into the state of domestic tameness, as our sheep, goats, and black cattle, 66 to 71.

Staggard, name of the stag the fourth year, ii. 67.

Stallions, law prohibiting exportation of stallions and mares, ii. 15.

Stanislaus, the exiled king of Poland, had a dwarf at his court, i. 255.

Stare, bird classed with the thrush, distinction from the rest of its tribe, iii. 145.

Star-fish, general description of the tribe; are also called sea-nettles; cut in pieces, every part survives the operation, becoming a perfect animal, endued with its natural rapacity, iv. 214, 215.

Starling, slender billed bird of the sparrow kind, living upon insects, iii. 141.

Stars (*fixed*,) supposed by philosophers suns, i. 10.

Stars, (*falling*) meteors or unctuous substances raised from the earth, i. 155.

Statues of antiquity, first copied after human form, now models of it. i. 2[illegible].

Sweetmeats, in tropical climates, exposed by day in the sun, to prevent their putrifying by the night air, i. 127.

Swift, a bird of the swallow kind; peculiar position of the toes, iii. 154.

Swiftness of savages, many surprising stories about it, i. 203.

Sword-fish, encounters the whale; its description, iii. 284.

Syagushes, carnivorous animals, like the jackal and wolf, hunt in packs, i. 280.

Symmetry, and proportion of the human body, i. 190.

Sympathetic, affection of yawning; a ridiculous instance of it practised upon professor M'Laurin, at Edinburgh, i. 194.

Synovia, a lubricating liquor in the joints, so called by anatomists, i. 201.

Syria, most of its cities destroyed in 1182 by an earthquake, i. 118.

T.

Tabbies, streaked cats, to which the civet's colour is compared, i. 171.

Tajacu. See *Peccary*, ii. 93.

Tails of sheep a foot broad, and weighing from twenty to thirty pounds, sometimes supported by a board upon wheels, ii. 44.

Talapoin, eighth division of monkeys of the ancient continent, ii. 267.

Talons, in what manner produced in animals, i. 198.

Tamaim, a monkey of the second sort of the sagoin kind; description, ii. 232.

Tamandua, an ant-bear, larger and smaller, lives upon ants, iii. 19.

Tamis-bird, one of the names of the Guinea hen, described, iii. 98.

Tanais, a principal river in Europe, parting it from Asia, i. 155.

Tanrec, of the hedge-hog kind, different enough to constitute another species; covered with prickles, though mixed with hair; only found in the East-Indies; Indians consider its flesh a delicacy, ii. 218.

Tapeti, the Brazilian rabbit. See *Rabbit*.

Tapir, the largest animal of America, not comparable to the elephant in size; of Africa, i. 284; considered as the hippopotamos of the new continent, iii. 16.

Tar used by the Laplanders for all disorders of the rein-deer, ii. 88.

Tarantula, the bite of this animal, and its cure by music, all a deception; instance of it, i. 224; native of Apulia, in Italy; description, iv. 116.

Tarcel, name falconers give the male bird of prey; and why, iii. 59.

Tariguagua, ruggedness of road from it up to the Andes, i. 64.

Tarnassar, great bird in the East Indies, no other than the condor, iii. 67.

Tarsier, a monkey, last of the class of the opossum kinds, ii. 272.

Tartars, their religion consists in part by managing their whiskers; they waged a bloody war with the Persians, as infidels, not giving their whiskers the orthodox cut, i. 196; Samoid, first distinct race of men round the pole, described, 240; the Ostiac, a race travelled down from the north, and originally sprung from minute savages, 242.

Tartary comprehends great part of Asia; natives and manners, i. 242.

Tatou, or armadillo, a quadruped; covered with shells, ii. 225.

Tatu-apara, first of the kinds of the armadillo; the second, the tatou of Ray, or the encoubert of Mr. Buffon; the third, the tatuette; their diversities described, ii. 228, 229

Teal, smallest bird of the duck-kind, distinguished, iii. 221.

Teats, great variety of them in animals; their form, and how placed, i. 200.

Teeth in cows, eight cutting teeth in their lower jaw, ii. 30.

Teeth, of animals various; how formed in man, i. 198; of the elephant, shed like horns of deer, or obtained after death, not yet known; natives of Africa find them in their forests; of the narwhale surpasses; ivory ascribed to a different animal, iii. 260.

Tegg, what the hunters call the doe the second year, ii. 73.

Tejuguacu, tockey, and cordyle, all of the lizard kind, gradually less, fill up the chasm between the crocodile and the African iguana, iv. 112.

Tempests, loudest formed by united contributions of minerals, vegetables, and animals, increasing the streams of air fleeting round the globe, i. 136; frequent under the tropics, and a space beyond them, 143; in Arabia and Africa described, 148.

Teneriffe, (*the peak of*,) a mile and a half perpendicular from the sea, i. 66.

Tendrac, an animal less than a mole, different from the hedge-hog, and a different species; description; grunt like hogs, and love to be near water, ii. 218.

Ternate, a Molucca island, its swallow taken for the bird of Paradise iii. 122.

Terrier, first division of dogs of the generous kind, used for hunting, ii. 132.

Testaceous substances on the tops of mountains, and in the heart of marble, i. 15.

Thales the philosopher, held all things made of water, i. 71.

Thames water, and that of the Indus, most light and wholesome, i. 71.

Theories of the earth, those, of the most celebrated authors, i. 16.

Theory of evaporation, for the formation of clouds, i. 147, 148; other theories upon that subject; theory of sympathy, of Father Malbranche, beautiful upon monstrous productions, 252.

Therasia, an island, appeared unexpectedly to mariners, i. 56.

Thermometer, measures heat and cold by a fixed standard; description, i. 75. See *Blood*, ii. 195.

Theutys, a prickly-finned abdominal fish; description of it, iii. 286.

Thibet, the musk from thence reckoned the best; sells at 14s. the ounce, ii. 60; the peacock there the most beautiful of the feathered creation, iii. 93.

Thoracic fish, that which has the ventral fins directly under the pectoral fins, iii. 261.

Throat of the great Greenland whale is so narrow, that any animal larger than a herring could not enter. ii. 247; but that of the cachalot can with great ease swallow an ox, 253; that of the shark most amazing, 261.

Thrush, a slender billed bird of the sparrow kind, iii. 141; its song, 144.

Thumb-footed shell-fish, testaceous, described, iv. 45.

Thunder, Ulloa heard it rolling beneath him, when upon the Andes, i. 65; its cloud always moves against the wind, 141; a sound produced by the opposition of two clouds, and continued by reverberated echo, 149.

Thyroid cartilage forms a lump upon the wind-pipe in men, not seen in women, i. 198.

Tides, with Pliny, were influenced partly by the sun, and in a greater degree by the moon; Kepler first conjectured attraction the principal cause of them; the precise manner discovered by Newton, i. 103 to 106.

Tiger leaps twenty feet at a spring, i. 280; perfectly resembles the cat; three sorts in Sundah Rajah's dominions; the royal tiger carries a buffalo over its shoulder to its den, ii. 113 to 119.

Tiger-cat, or cat-a-mountain, a beautiful animal of its kind, ii. 121.

Tigris, a great river in Asia, lost under mount Taurus, i. 93, 94.

Tingitanians, and Egyptians, famous for fine horses, ii. 10.

Tipula, (*water*,) of the second order of insects; description of it, iv. 148.

Tipula, long-legged gnat, description of this insect, iv. 205.

Titmouse, a slender billed bird of the sparrow-kind, iii. 141.

Toad, some bigger than ducks, i. 163; their flesh a delicacy on the coast of Guinea, ii. 137; differences between the frog and it, as to figure and conformation, iv. 48; curious particulars relating to this animal; description of the Surinam toad, called pipal, iv. 54 to 60.

Tococo, sort of cry, given as a name in Canada to the flamingo, iii. 179.

Toes, usually four in all animals of the poultry kind; in a species of cock amount to five, iii. 87.

Tongres, a city in the county of Liege, formerly encompassed by the sea, and at present thirty-five leagues distant from it, i. 112.

Tongue, the flamingo's much celebrated, and larger than that of any bird, iii. 179; of the great Greenland whale, fills several hogsheads with blubber, 245.

Tonquin, tides there the most remarkable in the world, i. 105.

Tornado, a formidable tempest, so called by the Spaniards, i. 145.

Torpedo, its description; by an unaccountable power, the instant touched, even with a stick, when immediately taken out of the sea, it numbs the hand and arm, or whole body; the shock resembles an electrical stroke; sudden, tingling, and painful; accounts by Kempfer of numbness produced by it, iii. 269 to 271.

Tortoise ranked among crustaceous fishes, though superior to them all; amphibious, according to Seba, distinguished in two classes, the *land tortoise*, and the *sea turtle*; account of a land tortoise caught in a canal at Amsterdam; and of a turtle in the Loire, in 1729, iv. 14 to 23.

Toucan, a bird of the pie kind, has a bill as large as its body; of five varieties; the red beaked described; its food; has birds, men, monkeys, and serpents to guard against; found only in the warm parts of South America, where it is valued for its tender and nourishing flesh, and the beauty of its plumage, particularly the breast, the skin of which the Indians dry, and glue to their cheeks for beauty, iii. 116, 117.

Touch, those parts of the body most exercised in touching, acquire the greatest accuracy; the fingers, by long habit, not from a greater quantity of nerves, become masters in the art, i. 229.

Tournefort describes a spout seen in the Mediterranean, i. 156.

Trachinus, the weaver, a prickly-finned jugular fish, described, iii. 285.

Trachipterus, the sabre, a prickly-finned thoracic fish; its description, iii. 286.

Track of a stag, manner of knowing it, and that of a hind, ii. 68.

Trade, of hair of animals, driven by the inhabitants of Angora, ii. 44.

Tragelaphus, name of the stag with the ancients, ii. 71.

Traps for horses, used by the Arabians for the wild sort, ii. 7; for wild asses, used in the Archipelago, 18.

Treacle, food for bees during winter, when robbed of their honey, iv. 178.

Trees, (*fossil*.) in the body of the solid rocks, and deep under the earth upon which they once grew; conjectures upon this subject, i. 27.

Trembley, first discovered in the polypus the power of reproduction, iv. 213.

Trichurus, a prickly-finned apodal fish of a sword-like form, iii. 284.

Trigla, the gurnard, of a spinous kind; description of this fish, iii. 286.

Trochus. See *Sea-snail*.

Troglodyte of Bontius, is the ouran-outang, or wild man of the woods, ii. 250.

Troglodytes, the mountain of that name in Arabia, has a passage made through it by a disruption, as if artificial, i. 67.

Trunks of animals, that of the elephant described, ii. 276; that of the gnat may justly be deemed one of Nature's master-pieces, iv. 206.

Trygon, the fire-flare, the enchantress Circe armed her son with a spear headed with the spine of this fish, iii. 268.

Tubes of glass, drawn as fine as a hair, still preserve their hollow within, i. 81.

Tubular vessels, discovered by Fallopius, and called his tubes, i. 166.

Tufted duck, a variety of the kind, native of Europe, iii. 221.

Tumble-dung, a strong beetle, remarkable for make and manners, iv. 200.

Tumbler, in the division of Dr. Caius, a dog of the first class, or generous kind; supposed the lurcher, and described, ii. 133.

Turbinated shells are univalves, and the first kind of Aristotle's divisions, iv. 27.

Turbits, variety of the tame pigeons, obtained by cross breed, iii. 134.

Turbots, (*and rays*,) extremely delicate in their choice of baits, iii. 267.

Turkey, bird of the poultry kind; its native country disputed; arguments for the old and new continent; first seen in France in the reign of Francis I. and in England in the reign of Henry VIII., iii. 92.

Turkey, in Asia, has, in different parts, horses of almost all races, ii. 12; lions found to diminish in number in this country, 106.

Turnings of rivers, more numerous as they approach the sea, become indications through trackless lands; the bends increasing, form different channels and mouths into the sea, as the Danube, Nile, Wolga, i. 85.

Turnspit, a dog of the mongrel kind, ii. 182.

Turnstone, a small bird of the crane kind, iii. 182.

Turtle-dove, one of the ruminating birds, iii. 30. See *Pigeon*.

Turtle, prepares for laying, and deposits her eggs in the sand, where in twenty-six days they are hatched by the sun; propagated on shore only; comes from sea on purpose in coupling season; female is passive and reluctant; the male is slow, but grasps so fast nothing can loose the hold, iv. 21, 22.

Tusks, those of a boar sometimes a foot long, ii. 89; of the babyrouessa a fine ivory, smoother and whiter than the elephant's, but not so hard; of enormous size, 98; of castrated animals scarce appear without the lips; those of a boar broken, abate his fierceness and venery, producing nearly the same effect as castration, 99; of the narwhale, or sea-unicorn, a cetaceous fish with teeth, from nine to fourteen feet long, iii. 251.

Twins, never while infants, so large or strong as children that come singly into the world, and why, i. 178.

Typhons, spouts so called seen at land; differ in several respects from those at sea, i. 157.

Tyson, (*Dr.*) See *Ouran-outang*, ii. 249.

V.

Valerian, a plant of which cats are excessively fond, ii. 103.

Valle, (*Pietro*,) his description of Persian horses, ii. 12.

Vampyre, a foreign bat. See *Bat*, ii. 231.

Vansire, a sort of ferret of Madagascar, according to Mr. Buffon, ii. 161.

Varenius, his opinion upon the formation of rivers, i. 84.

Vari, a kind of maki, last of the monkey kind; its description, ii. 269.

Vault, *go to vault*, phrase used by hunters when the hare enters holes like the rabbit, ii. 180.

Vegetable earth, the bed of it, in an inhabited country, must be always diminishing and why, i. 29.

Vegetation anticipated in its progress by bees, i. 183.

Velino, a river in Italy, has a cataract of 150 feet perpendicular in height, i. 92.

Velocity, not alone the actuating force of winds, but also the degree of density, i. 143

Velvet, like downy substance upon the skin, covering the skull. when the horn of a deer is fallen off, ii. 62.

Velvet-duck, a variety of the common duck, a native of the European dominions, iii. 221.

Venery, partridges immoderately addicted to it, to an unnatural degree, iii. 104.

Venom, given to the fire-flare by Pliny, Ælian, and Oppian, in a degree to affect the inanimate creation; many reasons to doubt of it, iii. 268.

Venus. See *Nose*, i. 188. See *Face*, i. 259.

Verges, or orifices of the snails, are two, one active, the other passive, iv. 33.

Vermin, hospitals erected by the Bramins in India for the maintenance of all kinds, of vermin, i. 144; less found with asses, than with other animals covered with hair, ii. 21.

Vertigo, in goats, produced by an immoderate cold, ii. 46.

Vesuvius, its eruptions, the most remarkable described by Valetta; account of another by bishop Berkley, i. 42, 43.

Vibrations. See *Tone*, i. 222.

Vineta, a port of Pomerania, overflowed and destroyed by the Baltic, i. 113.

Violet crab of the Carribbee islands, most noted for shape, delicacy of flesh, and singularity of manners, iv. 10.

Viper, most vivacious of reptiles; experiment on a viper in the receiver of the air-pump, by Mr. Boyle, i. 128.

Viviparous and oviparous animals, the two classes for generation and production; all other modes held imaginary and erroneous, i. 168.

Ukraine, the cattle there become very fat, and considered the largest of all Europe, ii. 33.

Ulloa, his description of South America, of Cotopaxi, of Quito, of the Andes, and a volcano, i. 45.

Umbilical vessels, those of the placenta to the fœtus, i. 176.

Unan, one of the two kinds of the sloth, an animal about the size of a badger, iii. 21.

Under-hung, expression among painters, meaning a prominent under-jaw, i. 194.

Understanding, comparative progress of it; greater in infants than in children of three or four years old, i. 183.

Undulations, in elastic bodies supposed by the ear one continued sound, though in reality many, i. 221.

Unicorn, of the sea, a whale with teeth in the upper-jaw; its description, iii. 251. See *Narwhale*.

Univalve shells, first division by Aristotle, as to figure, iv. 27.

Volcano, opinions of philosophers and ignorant men about it; three very remarkable in Europe, i. 41; Albouras most famous in Asia; one in the island of Ternate; in the Molucca islands, in Japan, in Java and Sumatra, in the Cape de Verde islands, the peak in Teneriffe, and also in America, 45; marine ones not very frequent, and why, 57.

Uranoscopus, a prickly-finned apodal fish; description of it, iii. 285.

Urchins, or erchini, a multivalve shell-fish; its description, iv. 44, 45.

Urinary passages, effects of the cantharides falling principally upon them, iv. 202.

Urine of animals found efficacious in some disorders, ii. 52.

Urson or *Hudson*, of the hedgehog kind, a native of Hudson's bay; its description, ii. 221.

Urus and bison in fact descendants of one common stock; this wild bull chiefly met with in Lithuania; description of it, ii. 32 to 34.

Vulture kind, vulture and dog, about Grand Cairo in Egypt, keep together in a sociable, friendly manner, and bring up their young in the same nest, ii. 139; description of the golden vulture, 68.

Vulture, bird of prey, next in rank to the eagle, less generous and bold, iii. 67; countries where found; unknown in England, 68 to 70.

Vultures, (*King of*,) description of this bird, iii. 70.

W.

Walfischoas, whales' provender, insects floating in clusters on the surface of the sea, and called Medusa by Linnæus, iii. 247.

Walnut-trees, with walnuts on the stem, leaves, and branches in exact preservation found at twenty-six feet depth round the city of Modena, in Italy, i. 115.

Wanderow, a baboon, less than the mandril, its description, ii. 259.

Wappe, dog of the mongrel kind, in the third division of Dr. Caius, ii. 132.

Warbling of birds, so loud and various in modulation, not easily to be accounted for, iii. 32.

Warine, the Brazilian guariba, largest of the monkey kind in America, ii. 267.

Waree, hog of the isthmus of Darien, described by Wafer, ii. 99.

Wasps, ruminating insects, or seemingly such, ii. 28; their description and habits, 186 to 190.

Water, its parts infinitely small; driven through the pores of gold; penetrating through all substances, except glass; enter the composition of all bodies, vegetable, animal, and fossil; birds, beasts, fishes, insects, trees, and vegetables, with their parts, have growth from it, and by putrefaction become water; gives all other bodies firmness and durability, i. 69 to 75; very compressible and elastic; made to resemble air; a drop of water converted into steam, capable of raising twenty ton weight; keeps its surface level and even; a single quart sufficient to burst a hogshead, and how, 76 to 79; water of the sea heavier and more buoyant than fresh-water, 100.

Water-spouts burst from the sea, and join mists immediately above them, i. 151; most surprising phœnomena, dreadful to mariners, and astonishing to observers of Nature, 156; solutions offered for this surprising phœnomenon, 157.

Water-wagtail, slender-billed bird of the sparrow kind, iii. 140.

Waves, their luminous appearance in the night, and the cause, i. 102.

Wax, the first fifteen days the bees make more wax than during the rest of the year, iv. 182; of two kinds gathered by common bees, 183, 184.

Weasel, a small carnivorous animal; marks common to the kind; one sort in America is by sailors called the stinkard; eats only by stealth, and will not touch the food until it begins to putrefy; account of a weasel's forming her nest, and bringing forth her young in the putrid carcase of a wolf; the white ermine found in Great Britain is called the white weasel; its fur among us of no value, ii. 155 to 160. See *Stinkard*, ii. 168.

Weather, the moist alone prevents evaporation, i. 148.

Weathercocks, often erroneous with Derham in regard to upper regions, i. 141.

Weaver, the trechinous, a prickly-finned jugular fish, its description, iii. 285; the sting given by its back-fin is poisonous, 301.

Weed, floating over great tracts of the sea, serve as sustenance for many fish, bearing similitude with such vegetables, i. 163.

Weight of the human body often found to differ from itself; instances of it; a man able to raise a weight of two thousand pounds; a horse will not carry upon its back above two or three hundred pounds; whence this seeming superiority comes, i. 201, 202.

Well, burning at Brosely, now stopped, had a fire-damp in it, which would kindle with the flame of candle, i. 40.

Welland, river near Spalding, has amazing shoals of sticklebacks, iii. 295.

Wert, (*Sebald*,) a traveller, confirms the existence of giants, on a coast of South America, towards the Straits of Magellan, i. 258.

Whale, the largest animal known; no precise anatomy of this fish yet given; Biscayneers practised the whale-fishery near Greenland soon after the year 1300; seven different kinds, distinguished by external figure or internal conformation; Great Greenland whale; its description; the female and male keep much together; their fidelity exceeds that of birds; do not cross breeds; she goes with young nine months, is then fatter than at other times, iii. 243 to 250.

Whale, (*Spermaceti*.) See *Cachalot*.

Wheat and currants swallowed whole, indigestible to man. iii. 54.

Wheat-ear, a short billed bird of the sparrow kind, thought foreign, iii. 142.

Whin-chat a slender-billed bird of the sparrow kind, iii. 141.

Whip-snake, a very venomous serpent of the East, is five feet long, and its bite kills in six hours time, iv. 99.

Whirlpool, the central point always lowest, and why; manner in which it is formed, i. 108; those of the ocean particularly dangerous, 109.

Whirlwind, the most rapid formed by united contributions of minerals, vegetables, and animals, increasing the current of air, i. 136.

Whiskers, a man without them formerly considered as unfit for company in Spain; Nature denying, art supplied the deficiency; a Spanish General borrowing money of the Venetians, pawned his whiskers, and took care to release them; part of the religion of the Tartars consists in the management of their whiskers, and they waged war with the Persians, as infidels, whose whiskers had not the orthodox cut; the kings of Persia wore them matted with gold thread, and the kings of France, of the first races, had them knotted and buttoned with gold, i. 196, 197.

Whiston, his reasoning concerning the theory of the earth; finds water enough in the tail of a comet for the universal deluge, i. 19.

White, the natural colour of man, all other tints proceed from greater or lesser heat of climate; among white races of people, our own country bids fairest for pre-eminence, i. 248.

White-bait, shoals appear near Greenwich in July, iii. 296.

White-nose, the moustoc, monkey of the ancient continent, a beautiful little animal; its description; a native of the Gold Coast, ii. 267.

White-throat, a slender-billed bird of the sparrow kind, living upon insects, iii. 142.

Widgeon, a variety of the European duck described, but best known by its whistling sound, iii. 221.

Wild Man of the woods. See *Ouran-Outang*, ii. 250.

Wind, a current of air; artificial; causes assigned for the variety, activity, continual change, and uncertain duration of it; in what manner to foretel the certainty of a wind, as the return of an eclipse; to account for variations of wind upon land. not at present expected; recourse to be had to the ocean, and why, i. 135 to 137.

Winds, (*Trade*,) blow from the poles towards the equator; various circumstances break its current, and drive it back against its general course, forcing it upon coasts that face the west; want of a true system of trade winds, supplied by an imperfect history of them; winds called monsoons; some peculiar to certain coasts; south wind constant upon those of Chili and Peru; other winds particular to various coasts, i. 138 to 140.

Winds at lands puff by intervals, and why; not so at sea; east wind more constant than any other, and generally most powerful; wind blowing one way and clouds moving another, forerunners of thunder; cause of this surprising appearance remains a secret, i. 141 to 143.

Wind-pipe in men has a lump not seen in women, i. 198; makes convolutions within a bird, and is called the labyrinth, this difference obtains in birds seemingly of the same species, iii. 32; strange in the throat of the crane, 164; of the bittern, 174; in the wild swan, 216.

Wings of birds, their description; bastard wing, iii. 29; flap of a swan's wing breaks a man's leg; a similar blow from an eagle lays a man dead instantly, 30; of butterflies, distinguish them from flies of other kinds; their number and beautiful colours, iv. 164.

Winter beginning round the poles, the misty appearance of heat in southern climates is there produced by cold, i. 154.

Wististi, a monkey of the sagoin kind, remarkable for the tufts of hair upon its face, and its annulated tail, ii. 268.

Wolga, its length; abounds with water in May and June; at other times very shallow; the English disappointed in a trade into Persia through it, i. 87; receives thirty-three lesser rivers in its course, 89; and has seventy openings into the Caspian sea, 58.

Wolf, wild dogs partake of the disposition of the wolf; the wolf taken young is gentle only while a cub; as it grows older, discovers its natural appetite of rapine and cruelty, ii. 129; experiments prove neither wolf nor fox of the same nature with the dog, but each a distinct species, 137; a fierce, strong, cunning carnivorous quadruped, externally and internally so nearly resembling the dog, they seem modelled alike, yet have a perfect antipathy to each other; description of the wolf; follow armies and arrive in numbers upon a field of battle; two or three wolves keep a province for a time in continual alarm; France, Spain, and Italy much infested with them; England, Ireland, and Scotland, happily free; King Edgar first attempted to rid this kingdom, and in what manner; Edward I. issued a mandate to Peter Corbet for the destruction of them, 140 to 146.

Wolf, (*Golden*,) the Latin name for the jackal, ii. 150.

Wolf-fish, the anarbicas, a soft-finned apodal fish, its description, iii. 287.

Womb, history of the child in the womb. i. 175; of the hare divided in two, as a double organ, one side of which may be filled, while the other remains empty, ii. 178; description of the false womb of the opossum, 270.

Woman, some continue pregnant a month beyond the usual time; those of Africa deliver themselves, and are well a few hours after, i. 178; in barbarous countries, the laborious duties of life thrown upon the women; the chief and only aim of an Asiatic is possession of many women; instance, in our own country, of a fine woman married to an eunuch; a principal employment of those of Thibet, is reddening the teeth with herbs, and making their hair white, 187 to 189; the body arrives at perfection sooner than in men; the persons of women as complete at twenty as those of men at thirty, 190; less apt to become bald than men; Mr. Buffon thinks they never become bald; there are too many instances to the contrary, 192; lower eye-lids drawn downwards when with child; the corners of the mouth also; then likewise high shouldered; circumstances under which the midwives call them all mouth and eyes, 199; the shoulders narrower, and the neck proportionably longer than in men, 200; first impulse of savage nature confirms women's slavery; the next of half barbarous nations, appropriates their beauty; and that of the perfectly polite engages their affections, 205; the bones, cartilages, muscles, and other parts of the body, softer than in men; a woman of 60 has a better chance than a man of that age to live to 80; women longer in growing old than men, 235; in the polar regions as deformed as the men, 240; women of India described; marry and consummate at eight, nine, or ten years old, and have children at that age; cease bearing before the age of thirty; those of savage nations in a great measure exempt from painful labours, 244; after a catalogue of deformities, Linnæus puts down the slender waists of women in Europe, by strait lacing, destroying their health, through a mistaken notion of improving their beauty, 251; remarkable instance of the power of imagination upon the fœtus, 252.

Woods, in Britain, cut down by the Romans, and for what reason, i. 116.

Woodcock, or *cock of the wood*, of the grouse kind; places which this bird inhabits; how distinguished from the other birds of the poultry kind; the delicacy of its flesh; its food and habitation, iii. 101, 102.

Woodcock, bird of the crane kind, its dimensions; food, iii. 182.

Woodchat, a rapacious bird, third kind of the butcher bird, iii. 78

Wood-louse, its description; has three varieties, iv. 123.

Woodpecker, of this bird are many kinds and variety in each; general characteristics; description of the *green woodpecker*, or *wood-spile;* called the *rain-fowl* in some parts; food; its tongue, the instrument for killing and procuring food, iii. 118 to 123

Woodward, his essay towards a natural history; detail of it, i. 18.

Wool, the Spanish finer than ours; but in weight not comparable to that of Lincoln or Warwickshire; some Spanish wool required to work up with it, ii. 42.

Worms of different kinds infest each species of fish, iii. 300; sea-worms make the shells of fishes their food, iv. 28; within the body of the caterpillar, devour its entrails without destroying its life, 168.

Worm, (*Blind*,) of the serpent kind; lies torpid all winter, iv. 101.

Worm, (*Froth*,) an insect in that sort of substance on the surface of plants, iv. 148.

Worm kind, general description of the earth-worm, iv. 211.

Wrasse, the labrus, of the prickly-finned thoracic kind, iii. 285.

Wren and *golden-crowned wren*, slender-billed birds of the sparrow kind, iii. 142; *willow wren*, a wandering bird of the sparrow kind, 143.

Wrinkles, whence those of the body and face proceed, i. 234.

Wry neck, or cuckoo's attendant, a little bird most active in the chase of the young cuckoo, iii. 124.

X.

Xiphias, or the sword-fish; of the prickly-finned apodal kind, iii. 284.

Y.

Young People sometimes cease growing at fourteen or fifteen, i. 189.

Z.

Zealand, inundations there, in which many villages were and remain overflowed, i. 113.

Zebra, the most beautiful, but wildest animal; a native of the southern parts of Africa; nothing exceeds the delicate regularity of its colour; its description, ii. 22 to 26.

Zebu, the Barbary cow, and the grunting or Siberian cow, are but different races of the bison, ii. 38.

Zeiran, name of the fourth variety of gazelles, by Mr. Buffon, ii. 53.

Zembla, (*Nova*) north wind reigns there during winter, i. 139; a description of its inhabitants, 240.

Zeus, the doree, or the prickly-finned thoracic kind, description of that fish, iii. 286.

Zibet, one of the two species of the civet, according to Mr. Buffon; distinction between them, ii. 170.

Zone, (*Temperate*,) properly speaking the theatre of natural history, i. 14.

Zone, (*Torrid*,) in the centre the heat very tolerable, in other places the cold painful; temperature and advantages of perpetual spring under it, i. 165; lightning there not fatal or dangerous, 151; has the largest quadrupeds; all fond of the water, ii. 37.

Zoophites, name of Vegetable Nature endued with animal life, iv. 209; first class of zoophytes, 210; all the tribe continue to live in separate parts: one animal by cuttings divided into distinct existences, sometimes into a thousand, 212; second class, 214.

Zorille, a stinkard of the weasel kind; resembles the skink; is smaller, and more beautifully coloured, ii. 169.

THE END

LIST OF PLATES.

VOLUME I.

Plate Page
1. Vignette Title 1
2. Varieties of the Human Race:—The Chinese, Laplander, Hottentot, Negro, and American 239

VOLUME II.

3. Arabian Horse, English Hunter, Race-Horse 5
4. The Ass, Ox, Sheep 17
5. Domestic Goat, Goat of Angora, Syrian Goat 45
6. Ibix, Chamois, Gazelle, or Antelope 49
7. Guib, or Harnessed Antelope, Codous, or Indian Antelope, Nanguar, Chevrotin 56
8. Stag, or Red Deer, male and female, Fallow Deer, male and female, Roebuck 60
9. Hippopotamus, Rein-Deer, Elk 77
10. Wild Boar, Domestic Hog, Hog of Siam 89
11. Lion, Lioness, Tiger 105
12. Panther, Leopard, Ounce 119
13. Jaguar, Lynx, Cougar 120
14. Caracal, Striped Hyena, Spotted Hyena 123
15. Bull Dog, Pug Dog, Shepherd's Dog, Domestic Cat, Grey Hound, Wild Cat 131
16. Rabbit, Hare, Fox, Wolf 140
17. Ichneumon, Jackall, Isates, Glutton 150
18. Ermine, Polecat, Squirrel, Otter, Badger 158
19. Zibet, Civet, Genette, Peccary, Lesser Ternat Bat 172
20. Flying Squirrel, Little Grey Squirrel, Palm Squirrel 191
21. Brown Rat, Dormouse, Marmot, Animal of the Bear Species 203
22. Guinea Pig, Long-tailed Squirrel, Water Rat, Short-tailed Field Mouse, Long-tailed Field Mouse 205
23. Hedge Hog, Shrew Mouse, Water Shrew Mouse, Bat, Garden Squirrel, Mole 215

Plate *Page*
24. Great Ternat Bat, Tamanoir, Pangolin, Armadillo............... 223
25. Oran Outang, Magot, Long-armed Gibbon, Little Gibbon.... 256
26. Malbrouck, Mandrel, Mocacco, Wanderow............... 262
27. Chinese Bonnet, Mangabey, Callitrix, Moustac.............. 266
28. Douc, Coaita, Talapoin, Gray Sajou....................... 267
29. Brown Sajou, Saimiri, Mico, Sai, Tamirin.................... 268
30. Marikina, Wistili, Saki, Pinch.............................. 269
31. Paca, Female Opossum, Female Marmose. Cayopollin, Male Opossum, Male Marmose............................... 270
32. Unan, Jerboa, Hamster, Ai, or Sloth, Tarsier.... 272
33. Elephant, Rhinoceros, Camel.......... 273

VOLUME III.

34. Beaver, Brown Bear, Greenland Bear........................ 12
35. Axis, Tapir, Zebra.. 16
36. Racoon, Agouti, Brown Coati, Black Coati.................. 17
37. Ostrich, Dodo, Cassowary.................................. 45
38. Golden Eagle, Great Vulture, Secretary.................... 60
39. Sparrow Hawk, Falcon, Buzzard, King Vulture............... 71
40. Swallow-tailed Falcon, Malabar Shrike, Horned Owl, Butcher Bird.. 76
41. Peacock, Wood Grouse, Quail, Partridge.................... 90
42. Speckled Owl, Guinea Hen, Bustard......................... 99
43. Impeyan Pheasant, Crested Currasow, Garrulcs Roller, Cornish Chough.. 111
44. Hoopoe, Promerops, Woodpecker, Kingfisher................ 118
45. Golden Oriole, Indian Bee-Eater, Nests of Tropical Birds..... 120
46. Goatsucker, White-backed Coly, Gold-headed Manaken, Tanagar.. 153
47. Spoonbill, Crane, Egret.................................. 161
48. Balearic Crane, Common Stork, Curlew..................... 168
49. Wattled Heron, Gigantic Crane, Black-faced Ibis........... 170
50. Red-necked Grebe, Puffin, Scooping Avoset, Flamingo, Great Auk.. 177
51. Sandpiper, Ruff, Sanderling, Oyster-Catcher, Water Crake.... 182
52. Boatbill, Jacana, Eared Grebe, Crested Grebe.............. 188
53. Pintail, Mute Swan, Pelican............................... 192
54. Yellow-nosed Albatross, Black-bellied Darter, Patagonian Penguin, Gannet.. 195
55. Shag, Cormorant, Frigate Pelican.......................... 200
56. Stormy Petrel, Kittiwake Gull, Common Gull, Pewit Gull..... 201
57 Little Auk, Red-throated Diver, Striated Tern, Great Tern.... 210
58. Red-breasted Merganser, Smew, Eider Duck................. 220
59. Common Whale, Narwhale, or Sea Unicorn................... 243
60. Blunt-headed Cachalot, Dolphin........................... 253

Pla. Page
61. White Shark, Hammer-headed Shark, Long-tailed Shark...... 260
62. Thornback, Torpedo, Sea Eagle, Saw Fish.................. 264
63. Sea Devil, Lamprey, Short Diodon, Oblong Diodon, Sturgeon.. 274
64. Angler, Fishing Frog, Globe Diodon, Lump Sucker, Unctuous Sucker.. 278
65. Hippocampus, Sea Porcupine, Wolf Fish, Electrical Eel, Pipe Fish... 279
66. Sword Fish, Opah, Dragonet, John Doree.................... 284
67. Cod, Viviparous Blenny, Remora, Perch, Ballan.............. 287
68. Mackarel, Tunny, Salmon, Trout........................... 291
69. Flying Fish, Dace, Roach, Carp, Tench..................... 298
70. Samlet, Loach, Gar Pike, Pike, Char...... 299

VOLUME IV.

71 Spiney Lobster, Violet Crab, Sea Tortoise, Land Tortoise..... 6
72. Trochus, Pyramidal Trochus, Large Turbinated Shell, Murex, Oriental Murex, Purple Painted Conch, Conch with the Animal.. 26
73. Frog, Pipal, or Surinam Toad, Chalcidian Lizard............ 48
74. Scaly Lizard, Crocodile... 62
75. Sea Urchins, Crocodile's Egg.............................. 64
76. Camelion, Siren, Salamander............................... 74
77. Cobra de Capella, Amphisbœna.............................. 79
78. Rattle Snake, Cerastes, or Hornet Viper, Common Viper..... 91
79. Flea, Garden Spider, Tarantula Spider, Scorpions, Centipede, Millipede.. 105
80. Queen Bee, Common Bee, Wasp, Locust, Mole Cricket, House Cricket, Grasshopper...................................... 139
81. Moths, with their Caterpillars and Aurelias............... 153
82. Butterflies... 163
83. Ichneumon, Gad Fly, Tipula, Gnat, Common Ant, Termes, or Ant of Africa, (King) Queen Ant pregnant, Labourer, Soldier 191
84. Earwig, male and female Glow Worm, Stag Beetle, Diamond Beetle, Rhinoceros Beetle, Hercules Beetle................ 197
85. Polypus, Nautilus, Sea Urchin Cuttle Fish, Shell of Nautilus . 215

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